SOCIAL CHANGE IN PRE-COLUMBIAN SAN RAMON DE ALAJUELA, COSTA RICA, AND ITS RELATION WITH ADJACENT REGIONS

by

Mauricio Murillo Herrera

A.B. *cum laude*, Universidad de Costa Rica, 1999

Lic. *summa cum laude*, Universidad de Costa Rica, 2002

M.A. University of Pittsburgh, 2008

Submitted to the Graduate Faculty of

Arts and Sciences in partial fulfillment

of the requirements for the degree of

Doctor of Philosophy

University of Pittsburgh

2009

UNIVERSITY OF PITTSBURGH

SCHOOL OF ARTS AND SCIENCES

This dissertation was presented

by

Mauricio Murillo Herrera

It was defended on

January 14, 2009

and approved by

John Frechione, PhD, Associate Director Center for Latin American Studies, University of Pittsburgh

Marc P. Bermann, PhD, Associate Professor, University of Pittsburgh

James B. Richardson III, PhD, Professor, University of Pittsburgh

Dissertation Advisor: Robert D. Drennan, PhD, Professor, University of Pittsburgh

SOCIAL CHANGE IN PRE-COLUMBIAN SAN RAMON DE ALAJUELA, COSTA RICA, AND ITS RELATION WITH ADJACENT REGIONS

Mauricio Murillo Herrera, PhD

University of Pittsburgh, 2009

Interregional relationships at close and long range have occupied more of archaeologists' attention in Central America than, for example, in Mesoamerica or the Andes. As a result we now have a considerable amount of detailed information demonstrating the existence of interregional contacts, both within the isthmus and with regions outside of it.

The actual impact that interregional relationships had on the processes of social change in Central America, however, has remained an open question. While some argue strongly that these processes of social change were strongly affected by interregional relationships, others argue that the sociopolitical impact of these contacts was weak, and that much more local factors carried more weight in the processes of social change.

I grouped different models of social change into three families according to where the primary source of social change is located. The first family of models emphasizes the internal conditions within a local region as the major stimulus for cultural change. The second family of models emphasizes dynamic relationships between neighboring regions. The third family of models emphasizes interaction across macroregions. Thus, the research presented here aimed to help evaluate how important interregional relationships were in the dynamic of social change in Central America.

Archaeological work done in several regions in Costa Rica has provided us with basic information about their sociopolitical development. Regional settlement study in San Ramón de Alajuela documented another trajectory to add to the comparison. Taken together, the results show that while in some cases interregional relationships were related to sociopolitical events happening in the participating regions, in other cases this did not happen. While some interregional relationships were very specific in other cases they seem to have been more all-inclusive. While some regions were integrated in networks of interregional exchange, these transactions had little impact on sociopolitical events. Furthermore, all of the above also varied substantially through time. Thus, as is common in social sciences, the question of whether interregional relationships were important in pre-Columbian social change does not have a binary yes or no answer, but instead it depends on where you look and when.

TABLE OF CONTENTS

PREFACE XIV

1.0 SOCIAL CHANGE AND INTERREGIONAL RELATIONSHIPS IN PRECOLUMBIAN CENTRAL AMERICA 1

1.1 MODELS FOR SOCIOPOLITICAL CHANGE 3

1.1.1 Emphasis on Local Processes 3

1.1.2 Emphasis on Dynamic Relationships between Neighboring Regions 5

1.1.3 Emphasis on Interaction across Macroregions 7

1.2 ASSESSING THE SOURCE OF CHANGE THROUGH COMPARISON OF DIFFERENT TRAJECTORIES 9

1.3 THE PREHISTORY OF SAN RAMÓN DE ALAJUELA AND ADJACENT REGIONS 12

1.4 ARCHAEOLOGICAL IMPLICATIONS OF THE DIFFERENT FAMILIES OF MODELS . 15

1.4.1 Emphasis on Interaction across Macroregions 16

1.4.2 Emphasis on Dynamic Relationships between Neighboring Regions 18

1.4.3 Emphasis on Local Processes 19

2.0 METHODOLOGICAL DESIGN 23

2.1 CHARACTERIZATION OF GEOGRAPHIC AND ENVIRONMENTAL CONDITIONS . 24

2.2 ARCHAEOLOGICAL SETTLEMENT STUDY 27

2.3 ARTIFACTS, CERAMIC ANALYSIS, AND REGIONAL CHRONOLOGY 32
2.3.1 Barba Ceramic Complex 34
2.3.2 Pavas Ceramic Complex 35
2.3.3 Curridabat Ceramic Complex 36
2.3.4 Cartago Ceramic Complex 37
2.3.5 Ceramics from the Guanacaste Region 38
2.4 SETTLEMENT DATA ANALYSIS 39
3.0 REGIONAL DEMOGRAPHIC RECONSTRUCTION 53
3.1 RELATIVE ESTIMATES OF PRE-COLUMBIAN POPULATION 56
3.2 ABSOLUTE ESTIMATES OF PRE-COLUMBIAN OCCUPATION 63
4.0 SOCIOPOLITICAL CHANGE IN SAN RAMÓN DE ALAJUELA 81
4.1 LOOKING AT VARIATIONS IN GENERAL SETTLEMENT PATTERNS 83
4.2 UNDERSTANDING THE SOCIOPOLITICAL PANORAMA, PHASE BY PHASE 87
4.2.1 Barba Phase (1000-300 B.C.) 87
4.2.2 Pavas Phase (300 B.C.- 300 A.D.) 88
4.2.3 Curridabat Phase (300-900 A.D.) 91
4.2.4 Cartago Phase (900-1550 A.D.) 94
5.0 CHARACTERIZATION AND COMPARISON OF PRE-COLUMBIAN SOCIOPOLITICAL TRAJECTORIES FROM NEIGHBORING REGIONS 115
5.1 COMPARING NEIGHBORING TRAJECTORIES OF SOCIAL CHANGE 117
5.1.1 Period 1000-300 B.C. 117
5.1.2 Period 300 B.C.-300 A.D. 120

5.1.3 Period 300-900 A.D. 124

5.1.4 Period 900-1500 A.D. 129

6.0 EVALUATING THE RELATIONSHIP BETWEEN PRE-COLUMBIAN SOCIAL CHANGE AND INTERREGIONAL INTERACTION IN SAN RAMÓN 134

6.1 EMPHASIS ON LOCAL PROCESSES 135

6.2 EMPHASIS ON DYNAMIC RELATIONSHIPS BETWEEN NEIGHBORING REGIONS 138

6.3 EMPHASIS ON INTERACTION ACROSS MACROREGIONS 143

7.0 SOCIOPOLITICAL TRAJECTORIES AND INTERREGIONAL RELATIONSHIPS: IMPLICATIONS FOR MODELS OF PRE-COLUMBIAN SOCIAL CHANGE AND FURTHER RESEARCH 152

7.1 IMPLICATIONS FOR MODELS OF SOCIAL CHANGE 152

7.2 IMPLICATIONS FOR FUTURE RESEARCH 155

7.3 REGIONS, COMMUNITIES, AND POLITICAL PHENOMENA 157

7.3.1 The San Ramón Region 158

7.3.2 The Central Highlands Region 161

7.3.3 The Central Pacific Region 163

7.3.4 The Central Guanacaste Region 165

7.3.5 The Arenal Region 167

BIBLIOGRAPHY 168

LIST OF TABLES

Table 3.1. Various ways to quantify the amount of pre-Columbian artifacts on the surface in the surveyed region by phase 71

Table 3.2. Estimation of the average of amount of people by hectare in the Central Region..... 71

Table 3.3. Scale used for estimating a maximum number of people by phase according to the maximum sherd density by phase 72

Table 4.1. Number of people living in local communities (hamlets or villages) during the Curridabat phase, in the San Ramón region 97

Table 4.2. Number of people living in local communities (hamlets or villages) during the Cartago phase, in the San Ramón region 97

LIST OF FIGURES

Figure 1.1. Costa Rica, San Ramón de Alajuela, and archaeological regions and subregions 20

Figure 1.2. San Ramón de Alajuela, and neighbor regions with regional archaeological data available 21

Figure 1.3. San Ramón region, modern towns, and major rivers 22

Figure 2.1. The San Ramón region, local geography. Source: Instituto Geográfico Nacional. 44

Figure 2.2. Location of the San Ramón region, the Central Valley, and other geographic features (altitudes in m.a.s.l.). Source: Denyer and Alvarado, 2007; Bergoeing and Malavassi, 1982 44

Figure 2.3. Geology and soil origins of the San Ramón region and neighboring localities. Source: Denyer and Alvarado, 2007 45

Figure 2.4. Examples of Barba ceramic complex found in the San Ramón region 46

Figure 2.5. Examples of Pavas ceramic complex found in the San Ramón region 47

Figure 2.6. Examples of Curridabat ceramic complex found in the San Ramón region 48

Figure 2.7. Examples of Cartago ceramic complex found in the San Ramón region 49

Figure 2.8. Examples of ceramic from Guanacaste region found in the San Ramón region 50

Figure 2.9. Unsmoothed surface representing Curridabat occupation in the San Ramón region 51

Figure 2.10. Three collection units from San Ramón rasterized into 100-m cells. Final values appear in the center of each cell on the right, based on the surface sherd densities and collection unit areas indicated at the left 51

Figure 2.11. Contour map of the occupational peaks in one section of the San Ramón region during the Pavas phase 52

Figure 3.1. Pre-Columbian occupation of the San Ramón region, period by period 73

Figure 3.2. An example of how several collection units comprise a single site, and the changing pattern of occupation through time of the same site 74

Figure 3.3. Modern settlement distribution in San Ramón de Alajuela. Source: Instituto Geográfico Nacional 75

Figure 3.4. Total number of collections in the San Ramón region by period 76

Figure 3.5. Total area of collections in the San Ramón region by period 76

Figure 3.6. Total number of sherds recovered from the San Ramón region by period 77

Figure 3.7. Density-Area Index for the San Ramón region by period 77

Figure 3.8. Barranca, notice the disturbed earth mounds and the stone used as foundation material 78

Figure 3.9. Location of settlements with mapped structures within the Central Highlands and Central Pacific regions 79

Figure 3.10. Region from where Dávila's descriptions of indigenous towns in 1566 come from, in relation to the San Ramón region, current towns, and Jesús María archaeological site. Sources: Ibarra 1990: Map 4; Lines and Meléndez 1961: Map 3; Solórzano 2000: 6 80

Figure 4.1. Maps of settlement distribution. Circles on the map enclose some areas where, despite the general dispersed regional settlement pattern, settlement clusters appear in certain phases 98

Figure 4.2. Settlement pattern distribution during the Barba phase 99

Figure 4.3. Settlement pattern distribution during the Pavas phase 100

Figure 4.4. Contour surfaces representing the population during the Pavas phase. Smoothing increases from top to bottom, with inverse distance powers of 4, 2, 1, .5, and .25, respectively 101

Figure 4.5. Surfaces representing the Pavas phase occupation. Smoothing increases from top to bottom, with inverse distance powers of 4, 2, 1, .5, and .25, respectively 102

Figure 4.6. Defining potential hamlets and villages for the Pavas phase 103

Figure 4.7. Defining potential districts for the Pavas phase 103

Figure 4.8. Settlement pattern distribution during the Curridabat phase 104

Figure 4.9. Contour surfaces representing the population during the Curridabat phase. Smoothing increases from top to bottom, with inverse distance powers of 4, 2, 1, .5, and .25, respectively 105

Figure 4.10. Surfaces representing the Curridabat phase occupation. Smoothing increases from top to bottom, with inverse distance powers of 4, 2, 1, .5, and .25, respectively 106

Figure 4.11. Defining potential hamlets and villages for the Curridabat phase 107

Figure 4.12. Defining potential districts for the Curridabat phase 107

Figure 4.13. Rank-size graph for local communities in the San Ramón region during the Curridabat phase (with a 90% confidence zone) 108

Figure 4.14. Settlement pattern distribution during the Cartago phase..... 109

Figure 4.15. Contour surfaces representing the population during the Cartago phase. Smoothing increases from top to bottom, with inverse distance powers of 4, 2, 1, .5, and .25, respectively 110

Figure 4.16. Surfaces representing the Cartago phase occupation. Smoothing increases from top to bottom, with inverse distance powers of 4, 2, 1, .5, and .25, respectively 111

Figure 4.17. Defining potential hamlets and villages for the Cartago phase 112

Figure 4.18. Smoothed surface map showing the integration of the entire San Ramón region during the Cartago phase 112

Figure 4.19. Rank-size graph for local communities in the San Ramón region during the Cartago phase (with 90% confidence zone) 113

Figure 4.20. *A* values for Curridabat and Cartago phase regional political integration compared 114

Figure 6.1. Comparing Sociopolitical Organization..... 148

Figure 6.2. Comparing Settlement Patterns 149

Figure 6.3. Comparing Variations in Population Size..... 150

Figure 6.4. Comparing Variations in Interregional Exchange 151

PREFACE

My work at San Ramón de Alajuela was financially supported by the US National Science Foundation (Dissertation Improvement Grant No. 0726548), and the Universidad de Costa Rica (Proyecto de Investigación: No. 211-A6-206). Preliminary visits and pilot studies in the field were funded by the University Center for International Studies (UCIS), the Center for Latin American Studies (CLAS), and the Department of Anthropology, all at the University of Pittsburgh. Logistical support was provided by the Archaeology Laboratory at the Universidad de Costa Rica, the Universidad de Costa Rica School of Anthropology, and the Museum of San Ramón de Alajuela. Project assistants included Alexander Rodríguez Villegas, Carlos Luis Reyes Picado, Jonathan Zamora Ríos, Roxana Araya Vega, Jose Francisco Chavez Jimenez, Josué Murillo Boza, José Carlo Bustos Ramos, and Kenneth Carvajal Maikel. Alexander Rodríguez Villegas, A. Patricia Rojas Hernández, Alexander Martin Noriega, and Felipe Sol Castillo, respectively, provided invaluable help with the identification and analysis of the artifacts. Esteban Calvo Campos and the Museo de Arte Costarricense made possible the use of professional photography equipment for some of the pictures incorporated in this document. Special thanks are due to Maureen Sanchez Pereira, Ana C. Arias Quirós, Felipe Sol Castillo, Flory Otárola Durán and the residents of San Ramón de Alajuela for their help in seeing this project through to completion. Finally, I thank the members of my doctoral dissertation

committee, and especially professor Robert D. Drennan, for their guidance and support through all stages of this research.

1.0 SOCIAL CHANGE AND INTERREGIONAL RELATIONSHIPS IN PRECOLUMBIAN CENTRAL AMERICA

A classic topic in Central America archaeology has been the study of interregional relationships between regions within Central America and with regions outside Central America. Interregional relationships at close (Fonseca 1997, 1998; Helms 1979; Hoopes 2005; Niemel 2005) and long range (Braswell et al. 2002; Lothrop 1966; Snarskis 1984a; Stone 1972; Willey 1971) have occupied more of archaeologists' attention in Central America than, for example, in Mesoamerica or the Andes. Thus archaeologists working in Central America have invested a considerable amount of time and research effort describing foreign-related—as well as local—artifact motifs, styles, and raw materials, and in studying the distributions of these things. As a result we now have a considerable amount of detailed information demonstrating the existence of interregional contacts, both within the isthmus and with regions outside of it (Corrales 2000; Fonseca and Richardson 1978; Lange, ed. 1993; Lange et al. 2003; Hoopes 2005; Quilter and Hoopes, eds. 2003; Snarskis 2003; Stone 1972, 1977, 1986).

The actual impact that interregional relationships had on the processes of social change in Central America, however, is still an open question. While some argue strongly that these processes of social change were strongly and pervasively affected by interregional relationships (Corrales 2000; Hoopes 2005; Joyce 1996; Schortman and Urban, eds, 1992; Snarskis 2003),

others recognize the abundant evidence of contacts, but argue that the sociopolitical impact of these contacts was weak, and that much more local factors carried more weight in the processes of social change (Drennan 1995, 1996a; Fitzgerald 1993; Langebaek 1991; Sheets 1992).

Models offered, then, to explain social changes, such as the emergence of complex sociopolitical organization, in different regions vary in regard to the importance assigned to interregional relationships. Some models assign the impulse for social development to entirely external sources, but others stress the importance of local endogenous processes. When we look at Mesoamerica, the Andes and Central America, for example, in broad comparative perspective, interregional relationships seem much more important factors in social change for Central America than for its neighbors. One can wonder whether we get this impression because interregional relationships actually were more important in Central America or because local processes have not been as fully investigated in Central America (Cooke 2005: 162) as they have been elsewhere. The research here presented aims to help evaluate, not whether different regions in Central America were in contact with each other (and more distant regions as well), but rather how important interregional relationships were in the dynamic of social change in Central America. This evaluation of the importance of interregional relationships is thought of in relative terms, that is, in comparison to the importance of more purely local factors. The particular perspective this research seeks to contribute is an assessment of the degree of independence to be found in different regional trajectories of social change within Central America. The emphasis, then, is on change in social organization, not change in the characteristics of material culture *per se*.

1.1 MODELS FOR SOCIOPOLITICAL CHANGE

I have grouped different models of social change into three families according to, primarily, where the source of social change is located. They are listed here in order of increasing importance assigned to interregional relationships in the dynamics of emerging sociopolitical complexity.

1.1.1 Emphasis on Local Processes

These models emphasize the internal conditions within a local region as the major stimulus for cultural change. The emergence of complexity (or, alternatively, the maintenance of an egalitarian configuration) is understood primarily in terms of local economic and political conditions, instead of in terms of external factors influencing local cultural change or sociopolitical endurance. Because each region has its own particularities and because social change is an autonomous phenomenon, there will be a considerable variety of regional social trajectories.

An example of this kind of model can be seen in Gilman's (1976, 1981, 1991, 2001) account of the emergence of complex society in southeastern Spain. Gilman identifies agricultural intensification and subsistence innovation as the causes of the emergence of complex society. In his model, the production of goods of concentrated value allowed the emergence of elites through the concentration of tribute, within a framework of regional competitive emulation (Gilman 1991). In a similar way, Earle has also stressed internal elements as the source of power and the emergence of complex political institutions. Economy, military

activities, and ideology are the social factors identified by Earle as the primary media used by chiefs in order to centralize power (Earle 1987, 1991, 1997). In his model leaders or chiefs within a given region (e.g. Upper Mantaro Valley in Peru, Thy in Denmark, or Kaua'i in Hawai'i) are the agents producing social change through the use of different strategies of concentration of power (Earle 1997). Thus the principal source of change in Earle's model is located internally in each of the regions he deals with. A final example of this general kind of model comes from Kirch's (1984) work in Polynesia, where internal warfare and ecological possibilities and limitations are seen as key factors in the varying development of chiefdoms and less complex forms of social organization in Polynesia.

In Costa Rica an independent trajectory of social change has been proposed for the Arenal region. Sheets (1984; 1992: 23, 26, 32-33; 1994; Sheets et al. 1991: 460-462) has argued that, even though large-scale sociopolitical integration has been proposed for Guanacaste and the Central Highlands regions, the pre-Columbian inhabitants of the Arenal region never developed a political entity larger than tribal society. Throughout its sequence, village economy was autonomous in Arenal, "in spite of variations in population densities, distributions, and contacts with outside societies" (Sheets 1992: 32-33). A primary reliance on wild species of plants and animals continued at least until the Spanish conquest; and subsistence, construction materials and artifacts came from local sources. Although changes in population densities happened in the region, the basic adaptation and village and household autonomy were maintained. Thus, the population in Arenal through its entire prehistoric sequence was highly stable, "with little evidence for displacement, migration, or invasion" (Sheets et al. 1991: 461). In order to pursue further evaluation of how different and independent the prehistoric

sociopolitical sequence in Arenal was from the cultural trajectories in other regions—such as the neighboring San Ramón de Alajuela region—fuller documentation is needed of the sociopolitical path followed by the people who inhabited those other regions.

1.1.2 Emphasis on Dynamic Relationships between Neighboring Regions

In models that emphasize particular kinds of dynamic relationships between neighboring regions social change is primarily internal in origin, although stimulated by specific economic and politic interregional relationships. These models are thus applicable to regions close enough that economic transactions among people exploiting different—and potentially complementary—resources were logistically possible.

This family of models is exemplified by Langebaek's (1991) study of Eastern Colombia during the sixteenth century. Using archaeological and historical information, Langebaek has argued that, by the time of the Conquest, there were unequal economic interactions between chiefdom-level (Muisca) societies inhabiting the eastern high Andes and egalitarian societies located in the foothills farther east. This unequal economic interaction did not imply conquest or the outright sociopolitical domination of foothill societies by the Muisca. Moreover, it does not seem that egalitarian foothill groups were in a process of becoming more like the Muisca chiefdoms. Langebaek's model emphasizes economic interaction between chiefdoms and tribes, and a political and economic disparity in the relationship. It does not, however, assume that egalitarian societies will adopt the political configuration of the more hierarchical groups just because of the unequal relationship. Instead, the model presents the possibility that

despite the influence of bigger and more complex sociopolitical groups, tribes could actually retain their social institutions, as well as their patterns of economic production and consumption, given their adaptive and complementary value within the economic system present in a particular region (e.g. Sheets 1992).

In comparison to the other models presented above and below, models that emphasize specific relationships as the source of social change also emphasize interregional connections in the trajectories of social change, but these models differ in several ways from the other two families of models. First, these models are focused on particular kinds of economic relationship between two regions, as opposed to broad and general sociopolitical and ideological influences. Second, these models apply to regions that are close enough that important economic interactions are logistically possible (given prehistoric transportation technology). Third, these models do not involve a process of sociopolitical homogenization that takes place interregionally. Instead, these models are open to the possibility that different kind of polities, such as chiefdoms and egalitarian groups, can coexist in neighboring regions without political or economic domination of one type of polity over the other; even though unequal relationships between them may be present. It is not assumed here that tribal leaders will necessarily emulate neighboring chiefs. Instead sociopolitical and economic specialization and exchange are seen as a necessary condition for this model.

1.1.3 Emphasis on Interaction across Macroregions

These models of social change have an inter-regional scale, dealing with multiple geographic and cultural regions. They emphasize interregional political, ideological and economic interactions and influences spreading throughout a number of different regions involved, thus homogenizing the trajectories of social change and producing similar sociopolitical forms across large territories. In these models the emergence of chiefdoms, for example, in one region will activate the emergence of chiefdoms in neighboring regions. Interregional contact is vital in this family of models since it is only through external political and economic interaction that the transmission and influence of ideologies is possible.

Such models may emphasize the role of elite interaction through networks of prestige good exchange and/or esoteric knowledge (Helms 1979; Shennan 1982). These interactions stimulated the leaders of egalitarian groups to emulate the religion, symbolism, dress, and behavior of the leaders of more complex polities. Thus, exchange of prestige goods—including marriage alliances—between the elites of societies of distinctly different degrees of sociopolitical complexity, from chiefdoms to egalitarian societies, is the medium through which more complex sociopolitical structure is propagated to simpler societies (Blomster, Neff and Glascock 2005; Diehl 2005; Diehl and Coe 1995; Kipp and Schortman 1989; Neff 2006). This chain reaction will produce a high degree of homogenization of the sociopolitical configurations of the societies in an archaeological area. Other models emphasize competition between political centers through the concentration of manpower, the intensification of agriculture, the exchange of sumptuary goods and the borrowing of ideas from each other (Flannery 1982;

Flannery and Marcus 2000; Flannery et al. 2005; Stoltman et al. 2005). Social change is seen to emerge collectively from the entire assemblage of interacting polities, that is to say it operates at the level of interacting regions. Thus within a short period of rapid social change a network of egalitarian societies in different regions become chiefdoms together. The outcome is that significant changes, and in particular increases in complexity, occur in multiple regions across large territories at about the same time (Renfrew 1986).

In Central America archaeology models that emphasize external relationships as the source of social change have been popular for a long time. These models have been used at different scales. Several archaeologists have emphasized interaction with Mesoamerica and South America as the main source of social change in Central America (e.g. Baudez 1970; Carmack and Salgado 2003; Coe 1962; Lothrop 1966; Stone 1966, 1977; Willey 1971). More recently, Snarskis (1981a, 1984a, 1984b, 1984c, 1986, 1987, 1998, 2003) has described social change occurring in pre-Columbian Costa Rica as the result of the diffusion of cultural traits from Mesoamerica and South America. Centers of high culture located north and south of Costa Rica "influenced" local technology, economy and ideology through long-distance relationships, thus impelling deep transformations at the sociopolitical level. Along similar lines, Hoopes (2005: 26-29) has pointed to long-distance interaction with Mesoamerica and South America as "external stimuli for cultural change" in southern Central America. Presence of jadeite before 500 A.D. and gold after that date, and stylistic studies of the iconography associated with the cultural material have been the evidence mainly used for supporting this argument.

At a different scale of analysis, focusing on inter-regional interaction within southern Central America—or the Isthmo-Colombian Area—several authors (e.g. Fonseca 1992, 1994,

1997, 1998; Fonseca and Cooke, 1994; Hoopes 2005; Hoopes and Fonseca, 2003) have emphasized external relationships on a slightly smaller scale as the principal source of social change. In this perspective, exchange of prestige goods stimulated reciprocal interaction among populations inhabiting different regions, and this inter-regional elite interaction created the conditions for the simultaneous emergence of chiefdoms among the different regions participating in the exchange network. Fonseca (1992: 130) has argued that interregional exchange of goods was present among the peoples located in Middle America long before the emergence of chiefdoms, and in later times this practice just continued, expanded and intensified. Because of this, these several authors have sustained a view of social change in Costa Rica as driven largely by interregional interaction, following more or less the same path through a succession of sociopolitical and economic stages (or "ways of life").

1.2 ASSESSING THE SOURCE OF CHANGE THROUGH COMPARISON OF DIFFERENT TRAJECTORIES

The proposed research requires the comparison of trajectories of social change. Archaeologists have recently compared trajectories of social change in different parts of the world, different environmental settings, and different temporal frameworks. This has allowed them to identify differences and similarities in prehistoric long-term development, in the forms that societies took, and the strategies that chiefs adopted in order to achieve and maintain power (e.g. Drennan 1991, 1995, 1996a; Earle 1987, 1991, 1997; Spencer 1993).

Central America has long been considered a classic example of an area where chiefdoms predominated in prehistory (e.g. Carneiro 1981; Snarskis 1984a; Steward 1948; Willey 1984). It thus represents an ideal setting for exploring the issue of (in)dependence among trajectories of social change. The particular approach to be followed in the proposed research grows, in a way, from an implicit conflict between two main pieces of traditional wisdom about Central American prehistory. On the one hand, there is the traditional view giving great importance to long-distance interaction with Mesoamerica or the Andes (Snarskis 1984a; Stone 1972; Willey 1971). On the other, there is the equally traditional view of a wide diversity of social trajectories in the region (Hoopes 1992; Sheets 1992; Willey 1984). The implicit conflict between these views has become sharper and more explicit recently, with some publications (e.g. Fonseca 1997; Fonseca and Cooke 1993; Hoopes 2005; Hoopes and Fonseca 2003) arguing strongly that perceived parallels in the sociopolitical trajectories of multiple Central American regions suggest a unified dynamic of social change operating across much or all of Central America and northern South America, while others counter with the view that considerable perceived diversity of regional sociopolitical trajectories (despite much contact and recognizable horizons of artifact styles) suggests highly independent developmental dynamics (Drennan 1995, 1996a). Thus, for example, several regions of Costa Rica (e.g. Diquís, Caribbean Watershed, Guanacaste) (Figure 1.1) have been described as all having a crucial period of transition from dispersed egalitarian societies towards much more centralized and hierarchical sociopolitical entities around 300-600 A.D. (Fonseca 1992; Hoopes 2005; Snarskis 2003). In contrast, the comparison of trajectories of social change of several fairly closely spaced regions such as Calima, the Alto Magdalena and the Muisca region is argued to show that, although centralized hierarchical

societies developed in all these regions, there are many differences in the character of centralization and hierarchy and in the pacing of the development (Drennan 1995; Langebaek 1992). Healy (1992) has compared sociopolitical development in western and eastern regions of Honduras, finding that considerable sociopolitical complexity developed in western Honduras but not in the east. Sociopolitical development in Pacific Nicaragua, however, has been described as closely linked with social processes happening in the neighboring region of northwestern Costa Rica (e.g. Lange et al. 1992).

The research described here is focused on the study of pre-Columbian trajectories of social change and their connection to local processes and interregional relationships. The study of trajectories of social change requires reconstructing patterns of prehistoric activities and social organization—things which cannot be inferred directly from the characteristics of artifacts themselves. The focus of this research, then, is *not* on studying or describing artifacts, styles, interaction spheres, or influences. The existence of abundant contact and interaction among regions in Central America has already been convincingly demonstrated. Instead, this research seeks to weigh how heavily that interaction affected local trajectories of social change. The central approach it will take is founded on the assumption that the factors stressed by the first family of models described above would produce great diversity in the character and pacing of local trajectories of sociopolitical change in different, even neighboring, regions. The dynamic emphasized by the second family of models would produce rather different patterns of organization in neighboring regions—periods of major transition would probably coincide chronologically, but the nature of the contemporaneous transitions in neighboring regions would be different, depending on their different specific roles in interregional interaction. And

the stress on large-scale interregional interaction in the third family of models would produce considerable uniformity in the social trajectories of many regions across large territories. The proposed regional settlement study of San Ramón de Alajuela would knit together a particularly interesting set of neighboring regions for carrying out the necessary comparisons.

1.3 THE PREHISTORY OF SAN RAMÓN DE ALAJUELA AND ADJACENT REGIONS

Archaeological work done in several regions in Costa Rica has provided us with basic information about their sociopolitical development (Figure 1.2). In the Arenal region, where the beginnings of sedentary agriculture are placed before the middle of the second millennium B.C., there may be two millennia or more of stable, egalitarian organization in scarce and highly dispersed populations (Sheets 1984; 1992: 23, 26, 32-33; 1994; Sheets et al. 1991: 460-462). Large dense settlements emerged in the Central Highlands between 300 B.C. and 300 A.D. Social organization in the Central Guanacaste region (Cañas-Liberia and Tempisque regions) during this period has been described as egalitarian, and large dense settlements are not yet known (Baudez 1967: 210-211; Guerrero and Solís 1997: 13, 59-60; 122). The following period (300 A.D.-900 A.D.) brought an increase in population in the Central Highlands (Aguilar 1974: 313; Snarskis 1981a), a trend perceptible but weaker in the Central Guanacaste region (Baudez 1967: 211-212; Guerrero and Solís 1997: 13, 124). Substantial sociopolitical complexity is described as emerging in the Central Highlands region after 300 A.D. (Aguilar 1974; Snarskis 1981a, 1992). Large hierarchical villages were described by the first Spanish who arrived in the Central Guanacaste region, but there is not currently any evidence that they emerged prior to

800 A.D. (Baudez 1967: 212; Guerrero and Solís 1997: 63). In the Central Highlands the largest scale of sociopolitical integration was reached around 1100 A.D. (Aguilar 1972: 134; Fonseca 1992). The San Ramón de Alajuela region has been chosen because it is situated among these several better-known regions (Figure 1.1), and fuller knowledge of the nature and timing of social transformations in San Ramón will especially facilitate the kinds of comparisons that can be made among these regions—comparisons that are the key to determining which of these three families of models most accurately fit the set of trajectories of emergence of complex social organization in central and western Costa Rica.

San Ramón de Alajuela is a small valley located in the western part of the Central Plateau of Costa Rica (Figure 1.3). A detailed account from 1899 described the contents of two pre-Columbian burials in San Juan de San Ramón (Navarrete 1899), which included artifacts made of gold and green-stone (raw materials [if not the artifacts themselves] commonly related to southeast and northwest Costa Rica, respectively). These burials, then, already suggested contact between San Ramón and populations inhabiting other regions. During the 1970's the Universidad de Costa Rica carried out partial excavations in sites like Barranca, Tejar and Chaparral (Linares 1975). The purpose was to determine the period of occupation of these settlements. Data from that pioneering research is available only for Chaparral site (Ducca et al. 1974), which was dated through the use of relative chronology. Since then, this region has been taken as part of the Central Highlands archaeological region (Aguilar 1974: 313; Aguilar et al. 1988: 290). The study of material culture, chronology and spatial distribution in the region continued during the 1980's, when an unsystematic regional survey identified 52 sites (Chávez 1994a). Again, the method used for dating the settlements was relative chronology. Ceramic

samples were recovered in haphazard surface collections in some sites, and through the excavation of trenches in some of the larger sites. The presence of Guanacaste pottery in these collections called further attention to the issue of San Ramón's inter-regional relationships, but Chávez (1991a: 28, 39; my translation) assessed that "only a detailed study in the future will be able to shed light on the reach of these relationships". Other topics of this early research included the study of pre-Columbian house-building techniques and the preservation of cultural material (Rojas 1995). This research was mainly focused on the Volio site.

With the results of the research project just described, Chávez (1994a) proposed differences between the trajectory of social change in the San Ramón region and those of the rest of the Central Highlands. Thus, for comparative purposes, I have taken San Ramón separate from the rest of the Central Highlands (Figure 1.1). The sociopolitical sequence resulting from pioneering research is as follows: There is no data from the Paleoindian or Archaic periods, but by the period between 300 B.C. and 300 A.D., the population in the region seems to have been very scarce and quite dispersed. Around 300 A.D. the population was stable, and small villages dedicated partially to agriculture already existed in the region. After 300 A.D. agriculture developed into the main source of food, and hunting and harvesting became complementary activities. A marked increase in population seems to have occurred during this period, but we do not know if this increase of population implied an increase in settlement size or the emergence of more settlements in the region or both. Additionally, around 500 A.D. the San Ramón region shows evidence of contact with other regions in the form of "foreign" artifacts found in San Ramón (Chávez 1994a: 39-40; Navarrete 1899: 31, 45, 48). Between 600 A.D. and the Spanish conquest some sites in the region became larger, and monumental architectural

features appeared in some of the sites. The largest sites of this period have wattle and daub structures, and cobble-stone enclosures and pathways (Chávez 1994a; Navarrete 1899: 31-32; Rojas 1995, 2008). Even though we have some preliminary archaeological information for the region we still know very little about its internal organization. Patterns of centralization or dispersion of settlement are undocumented; possible changes in emphasis on different local and external resources are unknown; and changing relative population densities through the periods of the sequence can only be vaguely approximated. Information of these kinds is critical for reconstructing the trajectory of sociopolitical change in San Ramón de Alajuela so that it can be compared to those of its better-known neighbors. Especially critical data for reconstructing these sociopolitical changes would come from a complete and systematic regional survey (The Chifeng International Collaborative Archaeological Research Project 2003; Drennan, ed. 2006; Fish and Kowalewski, eds. 1990; Kowalewski et al. 1989; Sanders, Santley and Parsons 1979).

1.4 ARCHAEOLOGICAL IMPLICATIONS OF THE DIFFERENT FAMILIES OF MODELS

The three families of models, as grouped above, have different implications about what kind of parallels and differences we should see when we compare the trajectories of social change in San Ramón and neighboring regions.

1.4.1 Emphasis on Interaction across Macroregions

Presentation of evidence in support of this family of models for Central America has been and continues to be mainly based on stylistic comparisons of cultural material and the study of cultural horizons and traditions (e.g. Corrales 2000, 2001; Hoopes 2005; Hoopes and Fonseca 2003). This evidence clearly demonstrates the existence of shifting patterns of contacts and communication across very large areas, and the existence of such interaction is not challenged here. This research seeks, instead, to focus on the nature and pacing of social, political, and economic change as an analytically different subject from stylistic similarities and interaction. In order to assess the degree of similarity between trajectories of social change without entering into logically circular arguments (that changes cultural horizons and traditions automatically imply changes in the social, political and economic organization), it is necessary to have reconstructions of the trajectories of social change in different regions that are independent from each other and from evidence about shared styles. It is, thus, important to disentangle the evidence of San Ramón de Alajuela from generalizations about cultural horizons and social change all across Costa Rica and Central America.

If external relationships played the dominant role in sociopolitical transformations in Costa Rican prehistory, as in the third family of models above, we would expect that the social trajectory of the San Ramón de Alajuela region would show sociopolitical transformations that are similar to and contemporaneous with those of other regions. Therefore the same climaxes in sociopolitical evolution—such as the emergence of larger centralized communities, the budding off of new settlements in demographic growth, the shift of settlement distributions

toward newly important kinds of resources, or the fragmentation of previously existing centralized communities—should be roughly contemporaneous among San Ramón and other regions. In particular, if stimulus diffusion from distant reasons were of major importance in social change, two climaxes of social change (not just change in artifact style, but change in social organization) should be identified across all the regional trajectories, including that of San Ramón de Alajuela. One of these climaxes would correspond to the introduction, about 600-400 B.C., of Mesoamerica-related carved jadeite artifacts; it would consist of intensification of maize agriculture, rapid increase in population, the budding off of new communities, the rapid colonization of the most fertile soils, and the emergence of centralized communities (Snarskis 1986: 113). The other sociopolitical climax would correspond with the replacement of carved jadeite artifacts in elaborate burials by South American-related gold at about 500-700 A.D. The social changes postulated for this transition would entail further population growth, inter-group resource competition and warfare, relocation of major settlements to defensible locations, and/or the splitting of large nodes of population into small but agglomerated settlements (Snarskis 1981a: 84; 1984a: 230-231). Such trajectories have already been reconstructed for some regions in Costa Rica, and we would expect the same in San Ramón. Some regions in Costa Rica might emerge as "leaders" in the reception of foreign sociopolitical traits and soon thereafter begin to spread this influence to other regions. Fonseca (1992: 116), for example, has identified the northern Pacific coast and the Guanacaste highlands as the local source of grain production, once the practice was imported there from Mesoamerica, because of their drier environment. This subsistence pattern soon spread to the Central Highlands, where chiefdoms first appeared and were consolidated (Fonseca 1992: 156). If this is correct, then,

given the position of San Ramón just next to the Central Highlands region, we should see the adoption of maize agriculture only slightly later that in the Central Guanacaste region and Arenal region; and the emergence of centralized chiefly communities slightly before the Central Highlands region as this wave of influence swept back.

1.4.2 Emphasis on Dynamic Relationships between Neighboring Regions

If dynamic relationships between neighboring regions were central in the dynamic of social change in Costa Rican prehistory, San Ramón de Alajuela would show a trajectory of social change that contrasts to those of neighboring regions, with regard to the nature and scale of sociopolitical organization. Nevertheless, because in this model change is stimulated by interregional economic relationships, there should be chronological correspondence between sociopolitical transformations in San Ramón and its neighbors, even though the transformations took different forms.

This kind of model has not previously been suggested in Costa Rican archaeology. However the setting of the Muisca case described above—productive highlands and possible foothill economic adaptive specializations between societies inhabiting neighboring regions—is particularly interesting for Costa Rican archaeology, especially given the high geographic diversity of Costa Rica, and the close proximity of different environmental settings.

San Ramón de Alajuela's soils are capable of supporting high food productivity (Echavarría 1966: 69-71) because of their recent volcanic origin and the multiple fluvial systems present in the basin (Bergoeing 1981: 155; 1998: 286-288; Bergoeing and Malavassi 1982: 18).

Thus, for example, local elites could have exchanged food surplus for prestige goods such polychrome ceramics and green-stone pendants from drier and less productive regions such as Central Guanacaste, much as Langebaek (1991) has suggested for the Muisca. In a scenario like this the activation of exchange networks should be contemporaneous with the emergence of centralized communities in San Ramón. Population growth might well be seen in the Central Guanacaste region, given the stimulus offered by the new demand for local products and access to non-local ones, but it would not be accompanied by the emergence of the same kind of centralized communities expected in San Ramón.

1.4.3 Emphasis on Local Processes

If purely local processes dominated the forces of social change in Costa Rican prehistory, there should not be many parallels in developmental sequences between San Ramón and neighboring regions. The nature of social changes that occurred would be different and/or similar social changes would occur but at different times. In this scenario the prehistoric trajectory of social change in San Ramón should not have any great correspondence with sociopolitical transformations (e.g. demographic growth or decline, emergence of centralized communities, shifts in settlement location) happening in other regions.

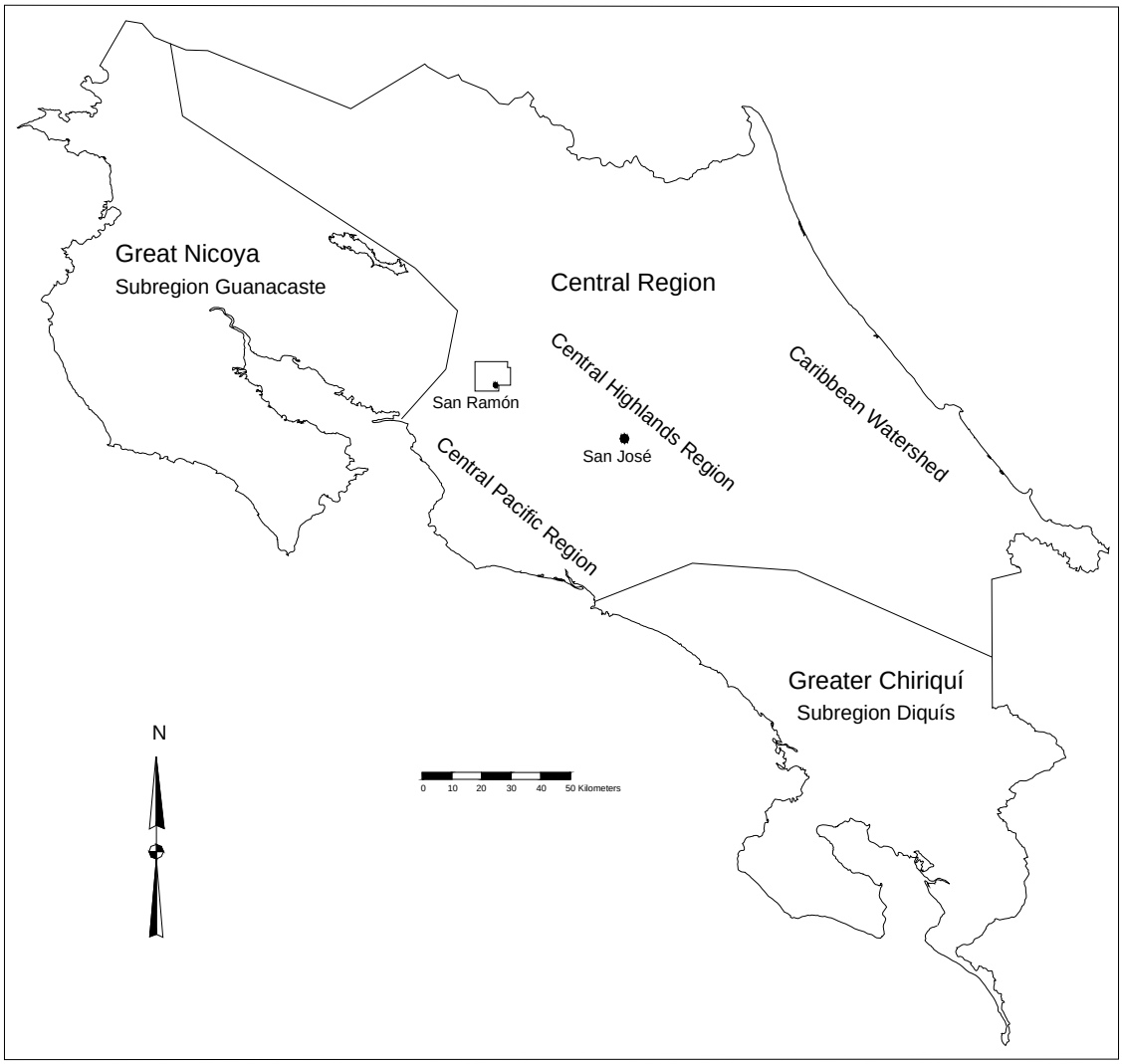


Figure 1.1. Costa Rica, San Ramón de Alajuela, and archaeological regions and subregions

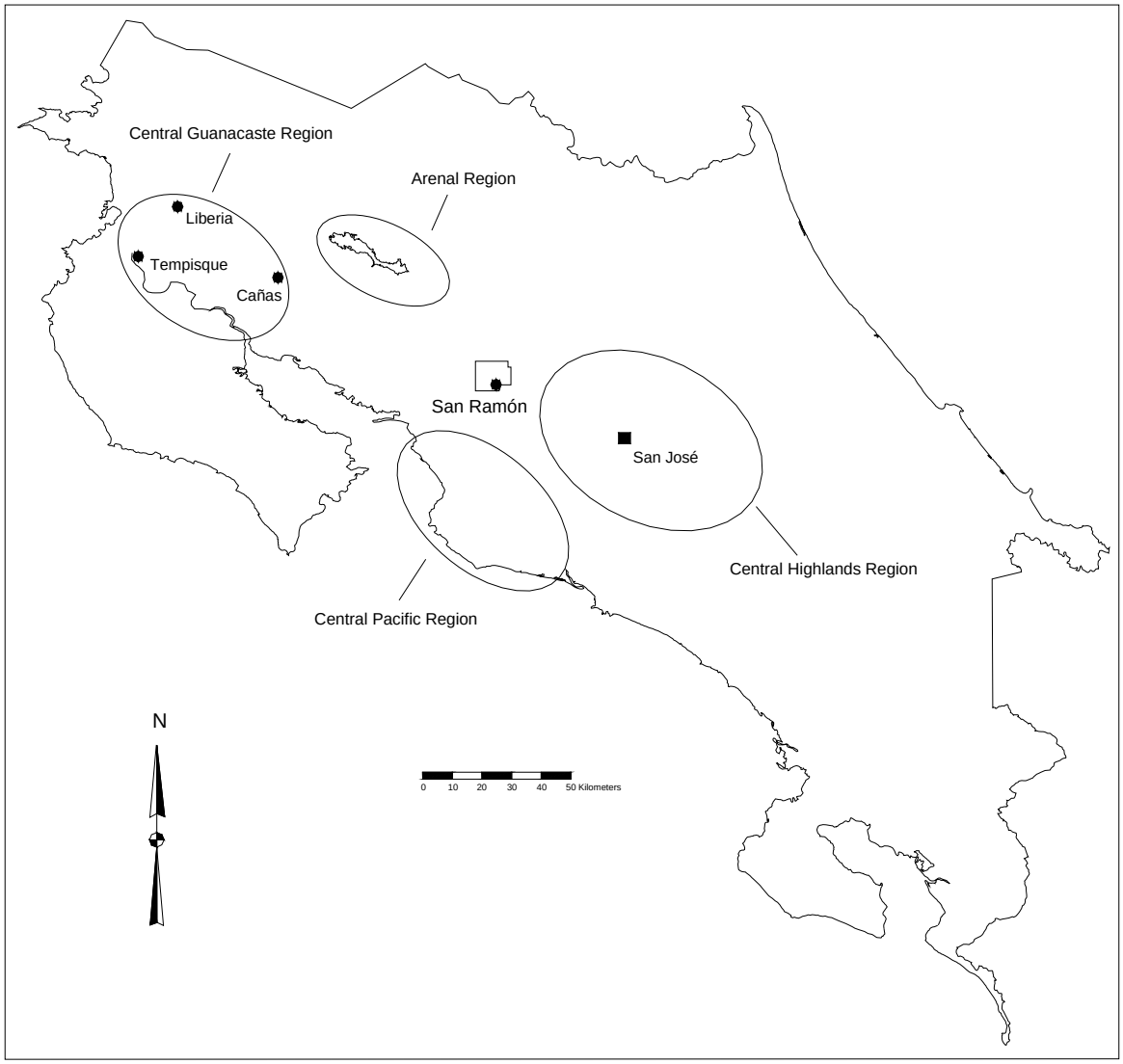


Figure 1.2. San Ramón de Alajuela, and neighbor regions with regional archaeological data available

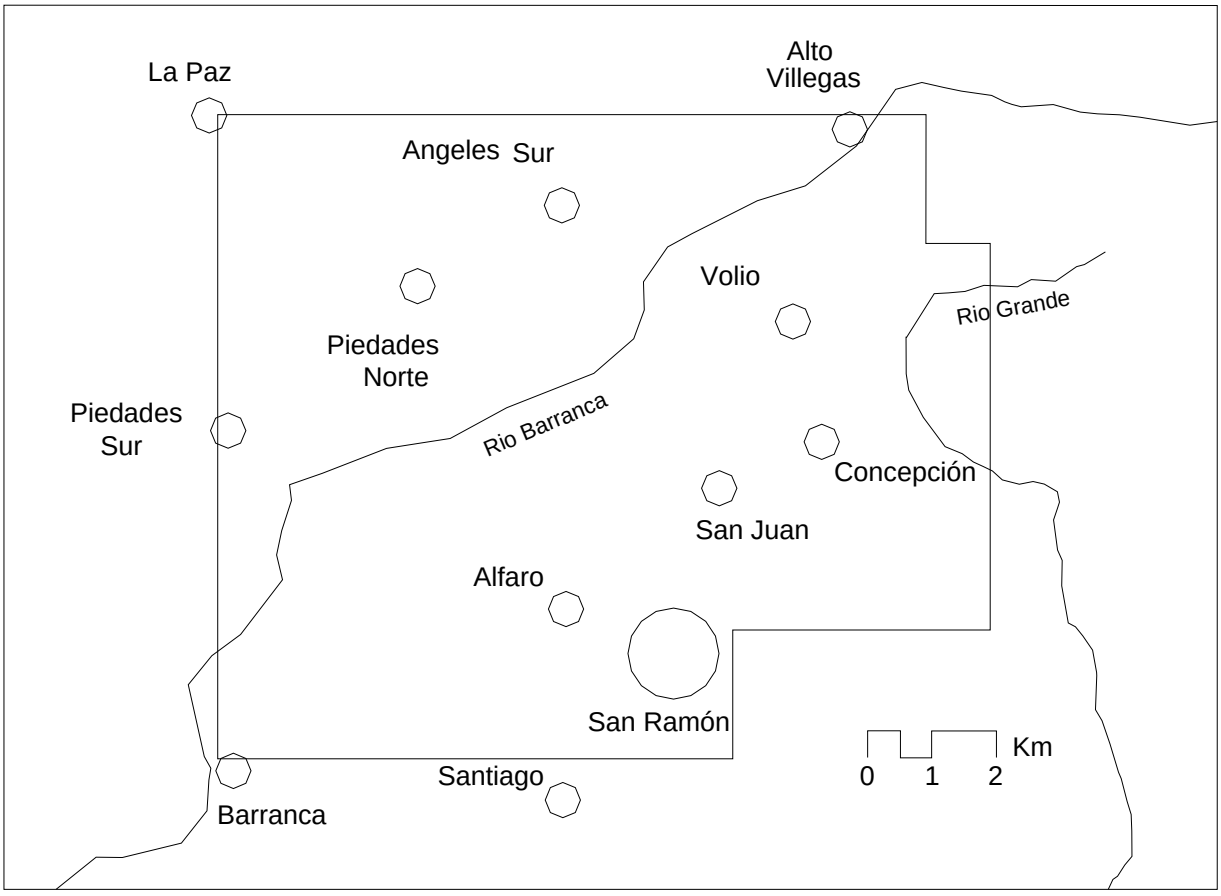


Figure 1.3. San Ramón region, modern towns, and major rivers

2.0 METHODOLOGICAL DESIGN

The comparative evaluation of the three families of models discussed above requires independent documentation of the broad outlines of long-term sequences of social change at the regional scale. Such information is at least partially available for some regions in Costa Rica from previous research (Guerrero and Solís del Vecchio 1997; Sheets and McKee eds. 1994), and the research here presented aimed to provide it for the San Ramón de Alajuela region. The reconstruction of regional trajectories of prehistoric social change involved outlining—among other processes—political expansion and collapse; demographic growth, centralization and dispersion; changes in emphasis on the control of local and external resources; and changes in investment in monumental and/or public works. Such processes can most comprehensively be outlined through systematic study of a regional landscape and the distribution of settlement in it. Such a study provides, in a relatively short time, a broad outline of the prehistoric sequence in an extensive territory. It shows roughly how large population was (and this is strongly related to social change in various ways). It shows how population distributed itself across the landscape (and this is strongly related to resource use, sociopolitical centralization, warfare, and other relevant factors). It provides a huge sample of artifacts from many sites throughout the region (and the patterns of spatial distribution of various kinds of artifacts are strongly related to patterns of social ranking, craft specialization, contacts with other regions, and other

relevant factors). A regional settlement study does these things for every period in the sequence, so it makes it possible to talk about change through time in all these variables.

I carried out a full-coverage systematic regional survey in San Ramón de Alajuela, covering approximately 110 km² (Figure 2.1). Full coverage survey was intended to provide detailed data on settlement distribution and hierarchies, identify spatial relations, and collect artifact samples.

2.1 CHARACTERIZATION OF GEOGRAPHIC AND ENVIRONMENTAL CONDITIONS

The San Ramón region is situated to the extreme northeast of the Central Valley on hills that jut off from the Aguacate Mountains and merge into the foothills of the Poás Volcano in the canton (Figure 2.2). The Central Valley is a high valley whose median altitude is around 1000 m, and it is a natural communication route between the Pacific and the Caribbean Sea. The valley is drained by two hydrographic systems: El Virilla-Tárcoles in the West and the Reventazón to the East; both systems are separated by a ridge known as La Carpintera, which splits the Central Valley in two: the Western and the Eastern side. San Ramón is located in the Western Central Valley, and this is the place where the main cities of Costa Rica (Alajuela, Heredia and San José) are located (Bergoeing 2007: 20, 28).

San Ramón is a system of mountains and small valleys drained by a complex river system. It is drained mainly by the Barranca and Grande rivers; they follow quite straight paths, from northeast to southwest. Given the volcanic material they carry—mostly landslide and mudflow alluviums, these rivers have deep canyons. The deep canyon of the Grande river

separates the region from the volcanic basin, at the northeast. The region was formed from volcanic material after the collapse of an old volcano, during the Tertiary (Pliocene); this event created a circular depression 5 km diameter (Figure 2.3). During the Early Quaternary the volcanic depression was filled, firstly with volcanic material (ashes, ignimbrite, tuff, lapilli) product of the action of nearby volcanoes, and later on with water and material coming from the northern watershed, until it became a lake. The lake survived until at least the Middle Quaternary. Lacustrine sediments ended up filling the lake, and forming the upper level of the current local stratigraphy. This level is formed by rather compact layers of lime, clay, kaolinite, and diatomite (Bergoeing 1981: 155; Bergoeing 1982: 5; Bergoeing 2007: 220; Bergoeing and Malavassi 1982: 18, 42-43). Clay and gold are the only minerals that have been extracted from San Ramón since the nineteenth century, and these yielded, only snall amounts (Echavarría 1966; Paniagua 1943).

The survey area is between 1,000 and 1,300 m in elevation, quite uneven and hilly (Figure 2.1). The temperatures tend to be very mild year-round: an average of 21° C; this is largely due to the region's altitude. The amount of rain accumulated during a year is around 2000 mm (1 mm of precipitation is equivalent to 1 liter per square meter). May through October is considered the rainy season with December to May considered the dry season. April and November are the months of transition from one season to the next. During July there is a decrease in rain during a period of two or three weeks, this phenomenon is known as the “Veranillo de San Juan” (Bergoeing 2007: 41; Mena 2008). Thus, following Holdridge (1964) life zones system the environment of San Ramón can be described as tropical humid premontane, varying according to the elevation (and therefore to the temperature) between wet and rain

forest. The native fauna within this environment includes some edible species such as the red brocket deer (*Mazama americana*), the tapir (*Tapirus bairdii*), the basilisk (*Basiliscus plumiforms*), the paca (*Agouti paca*), the mountain rabbit (*Silvilagus dicei*), and the great curassow (*Crax rubra*). This setting is also the source of high quality wood for construction; native trees include species such as black oak (*Quercus costarricensis*), *pilón* (*Hieronyma alchorneoides*), winter's bark (*Drimys wintery*), and *gumbo-limbo* (*Bursera simaruba*) (García, Boza and Zúñiga 1994; Zúñiga and Boza 1994).

Historical accounts from San Ramón only appeared after its modern occupation in the 1840's. These accounts do not mention any indigenous occupation when the recent settlers arrived to the region. Since the nineteenth century the region became famous because of its fine woods and highly productive soils, especially suitable for crop production (Echavarría 1966; Moncada 1917; Paniagua 1943; Pineda and Castro 1986). It is not surprising that the settlers had always recognized the high productivity of the soils, given their volcanic and lacustrine origin. Most of the local forest has now been eliminated because of the continuous human presence in the region since mid-nineteenth century; this has also caused strong soil erosion (Bergoeing and Malavassi 1982: 18, 42). However, even though the extensive deforestation San Ramón region faced during the twentieth century, its soils currently support intensive cultivation of coffee, corn, beans, potatoes, sugar cane, and vegetables. Current land use in San Ramón also includes pasture for cattle.

During the last two decades the main town of San Ramón has changed from being the center of an agricultural region to being a service-oriented city. The main town is located just next to the Carretera Interamericana (the main highway that passes through Costa Rica), this

road not only connects Nicaragua with Panama, but it is also the main route to Guanacaste, Puntarenas and the north Pacific coast within Costa Rica. It thus carries heavy traffic the whole year around, generating a great demand for services such as gas stations, restaurants, stores, supermarkets, etc. In addition, during the past two decades the main cities located in the Western Central Valley (San José, Alajuela, and Heredia) have grow in both size and population density, and nearby towns such as San Ramón—which 15 years ago was just a rural, low-density community—have experienced a steady immigration, urban grow, and increases in population density, from 43 people per square kilometer in 1985 to 84 in 2007 (Observatorio del desarrollo/Universidad de Costa Rica 2008). Thus, suburbs around the main town are quickly increasing in extent, and the people who are populating these new neighborhoods work mostly in industry and services. Agriculture and livestock raising still occupy most of the space in the region, although neither is as extensive as it was just a couple of decades ago. As at result, nowadays land in San Ramón de Alajuela is highly fragmented; it is mostly divided into small properties—sometimes no bigger than 1 ha—which means that it is not rare for a single square kilometer is owned to be dozens of landlords.

2.2 ARCHAEOLOGICAL SETTLEMENT STUDY

Survey methods were based, firstly, on systematic regional surveys around the world that were designed to deal specifically with issues related to regional sociopolitical reconstruction (Drennan, ed. 2006; Drennan et al. 2003a; Kowalewski et al. 1989; Sanders et al. 1979), and secondly on my previous fieldwork experience in the highlands of San Ramón de Alajuela as

researcher and teaching assistant for the University of Costa Rica in 2000 (Rojas 2000). Also, in 2005 I carried out a pilot project in the lowlands of San Ramón; this preliminary research confirmed the feasibility of the methods described here for recovering the necessary information.

Agricultural practices and cattle activities have disturbed region's soils for at least 150 years (Echavarría 1966; Navarrete 1899); and, in addition, archaeological sites in San Ramón are shallow—averaging 25 cm in depth (Rojas and Bustos 1995; Sol 2005; Valerio and Achío 2005). Thus archaeological material is located on the surface, quite visible for the collector. Because sites are shallow one can expect some immediate correspondence between surface and subsurface material proportions (Flannery 1976a: 53); this principle was further explored in this research, as explained later in the document.

Ideally, one would like to ask permission in advance from all the landowners in the region where the survey is going to take place; however, the characteristics of each region determine the feasibility of doing that. In San Ramón, because during recent decades small properties have replaced large farms it is completely impractical to even try to do this. Instead, as soon as a member of the project recognized that we were just about to move into a different property, we tried to locate the landowner and ask for permission to proceed with the survey. Even though in San Ramón people are in general quite friendly and easy to approach, common sense dictates that anyone can be potentially distrustful of unknown people entering their property. In addition to the usual dangers (poison snakes, beehives, strong river currents, and deep canyons), it is not uncommon in San Ramón that people use big dogs or guns to defend their possessions. Thus, in order to avoid potential problems with landowners and look after

the security of the people who were working with me, I dedicated most of my time to locating and talking with as many people I was able to, while the rest of the crew advanced with the survey. Landowners immediately agreed to let us survey their property. Only two owners (from a total of several hundred) did not allow us the access to their properties (which were no bigger than 1.5 ha).

Pre-Columbian sites previously documented in San Ramón de Alajuela tend to exceed 1 hectare (cf. Chávez 1991a), and they were identified by artifact scatters surrounded by empty areas. Thus, people walking 75 m apart along north-south zigzag transects were sufficient to survey the area with a very high probability of locating most of the sites. It was discovered in the field that the use of such narrow zigzag transects as crucial for the success of a survey in the region. As discussed below, the archaeological material in San Ramón is actually much more spread out on the landscape than was previously thought, and this implied the presence of concentrations of materials smaller than 1 ha. Sometimes a collection unit was spatially separate from others, but sometimes several were spatially contiguous. Sets of contiguous collection units are what we usually call sites; this is one of the reasons why the unit of data collection and analysis in San Ramón was not the site but the collection unit (Drennan et al. 2003a). Because of the hilly and irregular characteristics of the landscape in San Ramón, seven people walking 75 m apart were able to cover 5 km² every week. Therefore we required 20 weeks of survey in total.

When sherd density was high enough to make systematic surface collections a reasonable choice (that is, more than 5 artifacts/m^2), we collected all artifacts in circles with an area of 12.6 m² in order to measure surface artifact densities accurately. A collection circle was

placed in every hectare of a site. Therefore, sites larger than 1 ha are represented by multiple surface collections. We attempted to get a sample of 126 artifacts in each collection so as to estimate artifact proportions for the area of a given collection with an error range of ± 9 % at a 95% confidence level. In areas of lower surface artifact density (around 6-8 artifacts/m^2), additional circles had to be collected adjacent to the first so as to achieve a minimum sample size of 126 artifacts. These samples were taken to represent the areas of approximately 1 ha within which they are located, and formed the basis for estimating regional population levels and calculating proportions of artifacts between sites.

General collections were used only when artifact density in a given hectare was not high enough to make systematic collections a practical option (this is when it was evident that there were no more than 40-50 sherds in the entire hectare). General collections were made by collecting any sherd it was possible to detect within the 1 ha area. As mentioned above, sherd density in most of the region was low, which it means that most of the surface collections were made by using this technique. Every time a member of the survey found archaeological artifacts the surveyor had to decide which technique was appropriate to employ in that particular hectare. A quick examination around the first artifact found commonly gave us a good idea of how to proceed.

Even small sites (less than a hectare) were easily located on surface given the constant disturbance of the soils from agricultural or cattle activities. Surface visibility was sometimes obscured by vegetation, however; so additional techniques were employed. The obvious choice in this case is the use of shovel probes (Drennan 2000, 2006); nevertheless the Comisión Arqueológica Nacional (CAN 352-2007) asked signed permits from landowners in advance, to

allow the use of shovel probes. This requirement was problematic in many ways. Firstly, in 100 km² there are several hundred of landowners and, as previously pointed out, just to locate and to talk with the actual landowners took already quite a lot of time. Secondly, the presence of a witness—who has to be unrelated to the project and to the landowner—is mandatory at the moment the permit is signed. Thirdly, San Ramón landowners easily gave permission to enter their properties and collect sherds, but only as long as their signature was not involved and their properties remained undisturbed. Recent real estate swindles have made Costa Rican farmers especially suspicious of any person asking for signatures. Thus, as an alternative, when surface visibility was obscured by vegetation a careful examination of the surface was substituted for shovel probes. In those areas where ground cover was too heavy to permit artifact visibility, we used trowels or our hands to quickly clean and check areas of around 1 m diameter, at 75 m intervals. If we found material, we kept checking the area looking for further artifacts. This task was also facilitated by letting other team members know when artifacts were found, so that team members following transects to both sides of the person who just found material would pay even more attention to possible artifacts on the surface.

In order to be able to compare artifact densities between shovel probes and surface collections an experiment was carried out at the beginning of the fieldwork. In a few areas of pre-Columbian cultural material, within a circle of 2 m radius was counted, and immediately a 40 cm × 40 cm × 50 cm shovel probe was excavated in the center of the circle. Based on prior excavations in San Ramón, the amount of cultural material is insignificant deeper than about 50 cm. (Sol 2005: 13; Valerio and Achío 2005: 7-10). The artifacts from the shovel probe (including the number of artifacts on the surface within its 0.16 m² area) were counted and compared

with the number of artifacts from the surface collection. Regression analysis was used to establish the relationship between densities of artifacts on the surface and in shovel probes, and to establish a means of conversion between these two kinds of measure.

Collection lots were located on georeferenced aerial photos from NASA and the Costa Rican National Center for High Technology. We used photos taken in 2005, 1:25,000 scale, cloud coverage less than 20%, and a resolution of 2 x 2 to 4 x 4 m per pixel. During the fieldwork every member of the team carried a water-proof photo of the section we were surveying that week. Every time the surveyor made an artifact collection, he/she drew on the map the exact location of the collection. Every day data drawn on the photos was transferred to digital maps of the area, and an Excel table which included the collection number, number of sherds, and area of collection (both systematic and general) was updated on a daily basis.

Structures (mounds, plazas, stone pathways) in San Ramón are frequently visible on the surface, given that the deepest they are below the surface is around 25 cm (Chávez 1994a; Paniagua 1943; Rojas 1995, 2008). Thus, we were ready to make sketch maps of any features (mounds, structures, petroglyphs) visible on the surface.

2.3 ARTIFACTS, CERAMIC ANALYSIS, AND REGIONAL CHRONOLOGY

As mentioned above, the San Ramón region is located within a broader archaeological area known as the Central Highlands (Aguilar 1974, 1976; Aguilar et al. 1988; Chávez 1994), and, more exactly, in the western part of that region. Although there are broad similarities in the archaeological features and some ceramic wares of both the Central Highlands and the

Caribbean Watershed regions (Arias 1984), within each of these two regions there is a clearer homogeneity of ceramic horizons and geographic features. These, together with altitude, were the main criteria used by Aguilar for dividing the two areas. Accordingly, the ceramic sequence used in San Ramón has always been the one established for the Central Highlands region (Aguilar 1972, 1975, 1976, 1978; Snarskis 1981a, 1982), as is the case in this study. This sequence includes four phases: Barba (1000-300 B.C.), Pavas (300 B.C.-300 A.D.), Curridabat (300-900 A.D.), and Cartago (900-1550 A.D.). As in any other region in world, the chronology is constantly under revision (e.g. León and Salgado 2002), and there is no agreement among all the archaeologists about the exact extent of each phase. For this research I decided to use the most common ranges given in the archaeological literature for the western part of the Central Highlands (Aguilar et al. 1988; Arias and Chávez 1985: 99; Chávez 1994: Chávez and Arias 1987; Novoa and Hernández 2003: 106-107). No artifacts from the earliest phase (Barba) had ever been reported in San Ramón, but sherds from that phase were found in some collections made during the survey.

In the laboratory all items were organized, counted and preliminarily classified every other day. In order to obtain relative dates, ceramic artifacts were classified using the already-existing chronologies for the Central Highlands (Aguilar 1972, 1974, 1975, 1976, 1978; Arias 1984; Arias and Chávez 1985; Snarskis 1978, 1981a, 1981b, 1982) and the ceramic modes described for San Ramón de Alajuela (Chávez 1992, 1994b; Rojas 1995). The modes catalogued for San Ramón have not yet been organized chronologically, which made it especially difficult to relate them to ceramic phases. However, for some modes there is information about their stratigraphic relationships (Rojas 1995) and therefore some chronological correspondence. It

was also found that some modes were recovered from single-component sites, which allowed their chronological identification. All diagnostic artifacts were photographed. In the future, ceramics will also be classified as to form, function, and design. Lithics will also be counted and identified according to material, form, and possible use.

Except for the Valley of Turrialba (Acuña 2000), in Costa Rica the archaeological artifacts used for relative chronological purposes are ceramic; other artifacts—such as stone tools—are not really suitable for chronological reference (beyond a rough idea of what millennium that object was produced in), given that no chronological typology has ever been derived from them. It was important to identify the highest possible proportion of sherds. If there were very many unidentified sherds, this would introduce a large amount of random noise into the settlement survey data. This meant that we had to use mostly characteristics of temper, paste, and surface finish for the typology, since they are the characteristics that are likely to be identifiable even on plain body sherds. Also, any information about decoration or special surface finish that might indicate luxury wares, as well as functional information, was recorded.

2.3.1 Barba Ceramic Complex

Ceramics from this period are very similar to the contemporaneous Chaparrón and La Montaña complexes located north and east of the Central Archaeological Region (Snarskis 1982: 88). Basically, “Barba ceramic complex” (Figure 2.4) is just a name for all the Chaparrón and La Montaña ceramics found in the Central Highlands and Central Pacific regions. Thus, Barba complex decoration includes reed stamping, cord-wrapped roller stamping, and shell

impression, as well as rocker stamping, wide incised lines, oblique punctuation ("pinching"), "drag and jab", and cross-hatched incised lines usually with a multiple-toothed tool. Predominant forms are tecomates or incurving, restricted mouth bowls, but open, rolled-rim dishes and cylindrical jars with flat bases also occur. (Snarskis 1978: 112-128, 1982: 87-88). Paste can be characterized by the use as temper of reddish brown with black muscovite and red hematite particles, and, most apparent, dark to pearl grey particles, including basalt. These particles appear evenly distributed in the paste (Snarskis 1982: 89).

2.3.2 Pavas Ceramic Complex

The paste of the Pavas ceramic complex (Aguilar 1972, 1975, 1976; Arias 1984) is characterized by abundant white feldspar grains, black andesite, iron oxide, and muscovite, in smoothed surfaces (Figure 2.5). The texture is characterized by numerous air bubbles; surface color is light brown, from firing in an oxidizing atmosphere; and regions with slip are polished.

Other pastes are more refined, and the exterior surface is polished, although a laminar appearance is also present. The temper is mostly river sand, with different amounts of muscovite. Forms vary from open and restricted mouth bowls, with flat or slightly rounded sides and bottoms and a characteristic basal flange to globular oblate pear-shape vessels. Conical solid supports are also common during in this complex; some of them have ends turned outwards, like hooks. Annular supports are also present.

The characteristic decoration for the Pavas ceramic complex includes a band of decoration under the lip or the rim and a zone with the natural color of the paste, well

smoothed, and sometimes polished. Sometimes this zone is blackened (Aguilar 1975: 23). The slip or base paint is dark red or orange, with purple lines. Fluting, wide and fine incising, brushed decoration, fingernail incising, pinching, dentate rocker-stamping, shell and reed stamping, and appliqué pellets and other adornments are the most common plastic decorative techniques found in the Pavas complex. A wide variety of designs and patterns were used (Arias 1984: 51).

2.3.3 Curridabat Ceramic Complex

The most common vessel form from this complex is tripod bowls—ovoid vessels with long hollow supports, commonly with alligators and an extensive variety of other modeled adornments on the supports. Other decorative elements present in this ceramic complex include annular supports, fine and wide incising, excising, appliqué adornments, purple paint; punctuate flanged rims, pinching and reed stamping, white paint,, zoned red slip, and horizontally enlarged clefts (Figure 2.6). The appliqué decoration frequently represents very finely done zoomorphic representations (mostly reptiles) (Arias 1984: 50).

The paste color is brown or red-brown, while temper includes river sand, andesite, feldspar, and quartz; paste grains are easily visible. The texture can be characterized as friable, homogeneous, and well mixed; firing was in an oxidizing atmosphere; and both surfaces were smoothed. Other paste varieties show an unbalanced mixture of feldspar, iron oxide, and hornblende; appearance is sometimes sandy, with air bubbles. This ceramic shows a polished external surface, while the internal surface is smoothed; both surfaces show small hollows

resulting from decomposition of some organic inclusions. The most common forms include globular or oblate vessels with narrow mouths and bowls with inward or outward flanged rimsand convex or concave walls (Arias 1984: 50).

Africa Tripods, very characteristic of this complex, have very distinctive elements. The temper consists of quartz, zirconium, plagioclase feldspar, potassium feldspar and opaque minerals, with short transport distances indicating sand from decomposed volcanic materials. Vessels were formed by coiling; the surface inside and outside the pot was smoothed and polished. The body and neck were constructed separately, and smoothing sometimes left a mark close to the union. Supports and modeled adornments where added as decoration and the surface treatments included slipping and burnishing applied mainly on the neck. The pieces were burnished with a pebble and some artifacts show the remains of paint that was poorly preserved (Skirboll 1981).

2.3.4 Cartago Ceramic Complex

Temper includes river sand, andesitic black grains, iron oxide red grains, mica, and feldspar, in an irregular mixture with air bubbles and smoothed surfaces (Figure 2.7). In other cases the paste is well knit and very homogeneous. Forms include composite silhouette bowls, with avisible mark at the union between the bottom and the body walls; there were also simple bowls and globular oblate vessels with either open mouths and outward lips, or narrow necks, straight walls, and outward lips or wide necks and convex walls (Arias 1984: 52).

The most characteristics vessels from this complex are cylindrical; but there are also tripod bowls, and pots. Supports include animal or human-like faces and engraved annular pedestals. Decoration includes scratching, painting (most commonly, red, black and yellow lines forming geometric patterns), fine incising forming geometric designs, and loop-shaped handles (Aguilar 1972, 1976; Arias 1984: 52).

2.3.5 Ceramics from the Guanacaste Region

Ceramics from the Guanacaste region have been recognized in the San Ramón region (Chávez 1991a, 1994a). This pottery "is easy to identify because of its paste and colors…[and] it is the strongest evidence for inter-regional contacts" (Chávez 1991a: 39, my translation). In the present research ceramics from three pre-Columbian phases from Guanacaste were identified: Tempisque (500 B.C.-300 A.D.), Bagaces (300-800 A.D.) and Sapoá-Ometepe (800-1550 A.D.) (Figure 2.8). Ceramics from the Tempisque ceramic complex (Baudez 1970: 68-69) are characterized by combinations of painted and incised decoration—alternating groups of incised straight lines and areas painted in red, and elementary geometric motifs (parallel straight lines, triangles or chevrons). Several types show incised or impressed decoration, including shell impressions, zoned punctuation and incised motifs. The shapes include jars, shallow or hemispherical bowls, squat composite-silhouette jars, bottle-shaped jars, footed cylindrical jars with a rim under the lip, zoomorphic jars and pot-stands. The subsequent ceramic complex, Bagaces, consists of tripod bowls and small squat jars made of fine paste, with a well burnished orange-red surface. The decoration is mainly incised, but also uses punctuation, modeling and

appliqué motifs. Painted decoration was broadly more used in this ceramic complex. Black, red, and cream are among the most used colors. The last ceramic complex, Sapoá-Ometepe (Snarskis 1983: 57-61), has a great diversity of polychrome ceramics, executed mostly in red, black and maroon on a buff-orange ground. Decoration includes painted geometric patterns, simple bands, and complex figural scenes. The range of forms goes from simple hemispherical bowls to jars, zoomorphic and humanoid effigies.

2.4 SETTLEMENT DATA ANALYSIS

The methods of analysis followed here have been published in detail elsewhere, either separately (Drennan et al. 2003b; Drennan and Peterson 2004; Peterson and Drennan 2005) or all together integrated in case studies (Drennan, ed. 2006; Peterson 2006). The social theory behind the chosen methods and the specifics arguments for their selection are outlined in detail in Chapter 3 and Chapter 4.

Several GIS analyses were employed for reconstructing the population of San Ramón for each pre-Columbian phase. All the analyses were performed in the archaeology laboratory at the University of Pittsburgh during 2008. In order to study how the population changed through time in relation to size and density, at the local (hamlets, villages), and regional level (districts, rural population, and entire regional population) The distribution of people across the landscape was represented as a surface whose elevation is proportional to local population density (Figure 2.9), for each phase. Areas and densities of surface sherds were used as archaeological proxy measures of local population densities. The resulting surfaces were based

on a regularly spaced grid of *z*-values at 100-m intervals. These values are surface densities of San Ramón ceramics (sherds/m²) recorded systematically, as described above. Figure 2.10 shows how sherd densities in three collection units from San Ramón become *z*-values at 100-m intervals. Inverse distance squared was the algorithm used for producing all the surfaces and contour maps, and the smoothing power (4, 2, 1, 0.5 or 0.25) used for each surface and map is mentioned in its respective legend. The comparison of different surfaces with their corresponding contour maps of sherd densities provided a basis for systematically clustering collection units into meaningful groupings when they indeed exist (Peterson and Drennan 2005: 23-26). An appropriately selected low contour level was chosen to outline the bases of the peaks and show clusters of multiple collection units (Figure 2.11).

Surface and contour maps made it possible to delineate local and supra-local communities in a systematic way. Although, as Peterson and Drennan (2005: 10) have stated, the analysis remains with a certain degree of subjectivity—in that it provides no absolute or objective criterion for selecting a cutoff contour—visualizing occupational distributions as density surfaces facilitates the recognition of peaks that reveal the interaction patterns that constitute small, local communities and larger, regional communities. The systematic delimitation of these settlement clusters and single units for each phase in San Ramón created the basis for transforming each of them into real sociopolitical entities: camps, rural houses, hamlets, villages, or districts.

Hamlets and villages were defined by using the concept of local communities introduced by Murdock (1949) and adapted as an analytical tool for archaeology by Peterson and Drennan (2005: 7) as "when the range of social interactions is intensely concentrated within a single

well-defined group of households that interact only much less intensely with households outside the group". Thus, it was necessary to pick a contour level which enclosed areas with diameters not larger than about 1 km, "which would seem near the upper limit for daily face-to-face interaction" (Peterson and Drennan 2005: 10). This last statement is even more suitable for San Ramón, given the steep conditions of the terrain, which makes walking from one point to another not as easy as in more level landscapes. Thus, unsmoothed (power 4 or higher) surfaces and contour maps were used for determining the existence of local communities and dispersed population. Once the appropriate contours were chosen it was possible to estimate the approximate number of people enclosed in each of them. This was carried out by multiplying the density-area index of each cluster by two different factors, so that a maximum and a minimum number of people were assigned to each of them, and for each pre-Columbian phase. The way that these two population factors were calculated is discussed in detail in Chapter 3. Thus, by knowing the approximate number of people in each grouping it was possible to know the sociopolitical nature of each grouping (a house, a hamlet, a village), according to the population size it hosted. The concept of "hamlet" was used for describing between four to ten families (between 16-36 persons) living close together; and the concept of "village" was left for cases when that number reached twelve families or more (more than approximately 40 people). The size of rural or dispersed population was calculated by finding the difference between the total population calculated for the entire region for phase (Chapter 3) and the total amount of people hosted in local communities (hamlets, villages) (Chapter 4) for the respective phase.

The existence of larger sociopolitical entities and districts (Peterson and Drennan 2005: 11-15) was also explored for San Ramón region. Smoothed surfaces and contour maps (powers between 2 and 0.25) were used to investigate if larger social structures, such as regional communities and districts, existed in a particular phase. Elevated large sections of the smoothed demographic surface separated from other sections by valleys represent a higher level of interaction among people living within these sections than with people outside of it. However, once again, in order to evaluate if the elevated surfaces corresponded to the expected amount of people large social entities should contain, it was required to take into account not only the territorial size encompassed by the elevated surfaces but also the approximate number of people living within. Thus, absolute numbers of people were also estimated for potential supra-local communities, in order to find out if districts emerged in any of the pre-Columbian phases of San Ramón de Alajuela.

Finally, rank-size graphs for each phase were produced (Johnson 1980, 1981; Wright and Johnson 1975) in order to evaluate how integrated the regional political system of San Ramón was throughout its pre-Columbian trajectory. The logic behind rank-size graphs is, as its name straightforwardly says, is to understand the relation between a given rank of settlements and their actual population. A rank of sites is defined for their hierarchy of size; in this case individual houses would compose all together just one single rank. Thus, if many small houses are included into a rank-size analysis they will be considered as many different low ranks. This would pull the lower extreme of the observed line so far below the log-normal line that the general pattern one is expecting to see will be obscured and distorted. In cases where the database includes too many small units, therefore, including only the upper settlement units

should be sufficient, and even recommended. Consequently, only population size of local communities was used to produce the rank size in Chapter 3. The *A* coefficient (Drennan and Petersen 2004) was used to measure the shape of each graph (beyond just describing it as convex, primate or primo-convex), and a bootstrap was used to assess statistical confidence.

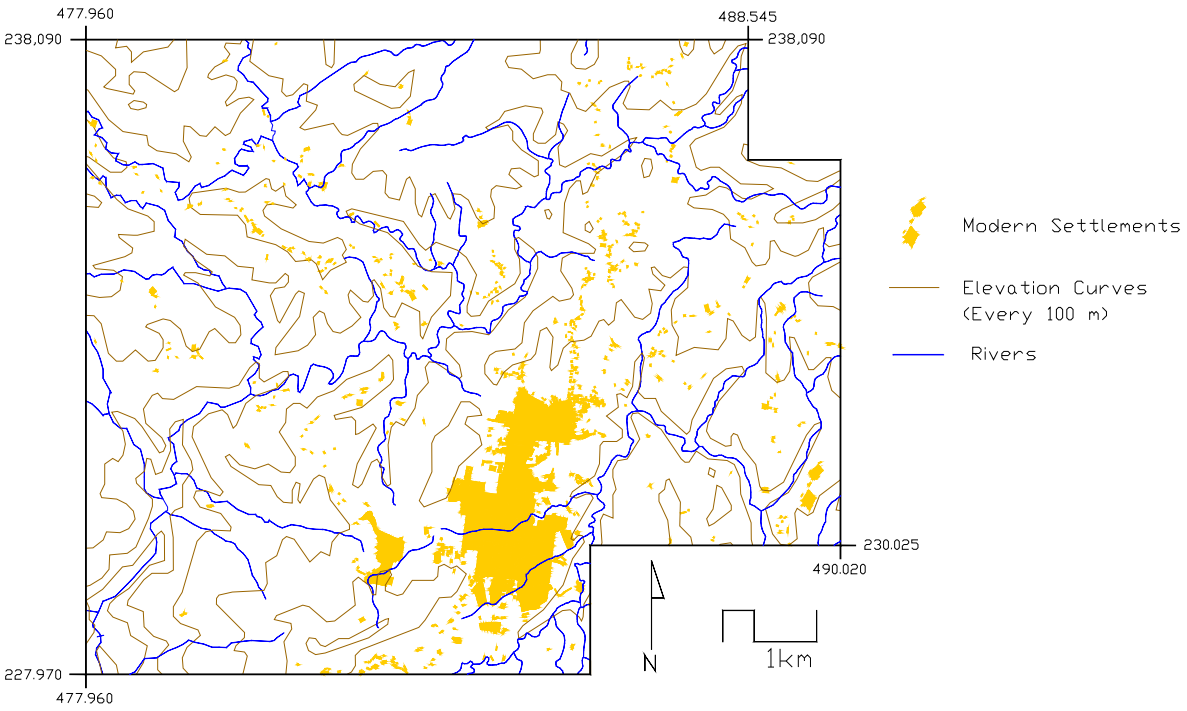


Figure 2.1. The San Ramón region, local geography. Source: Instituto Geográfico Nacional.

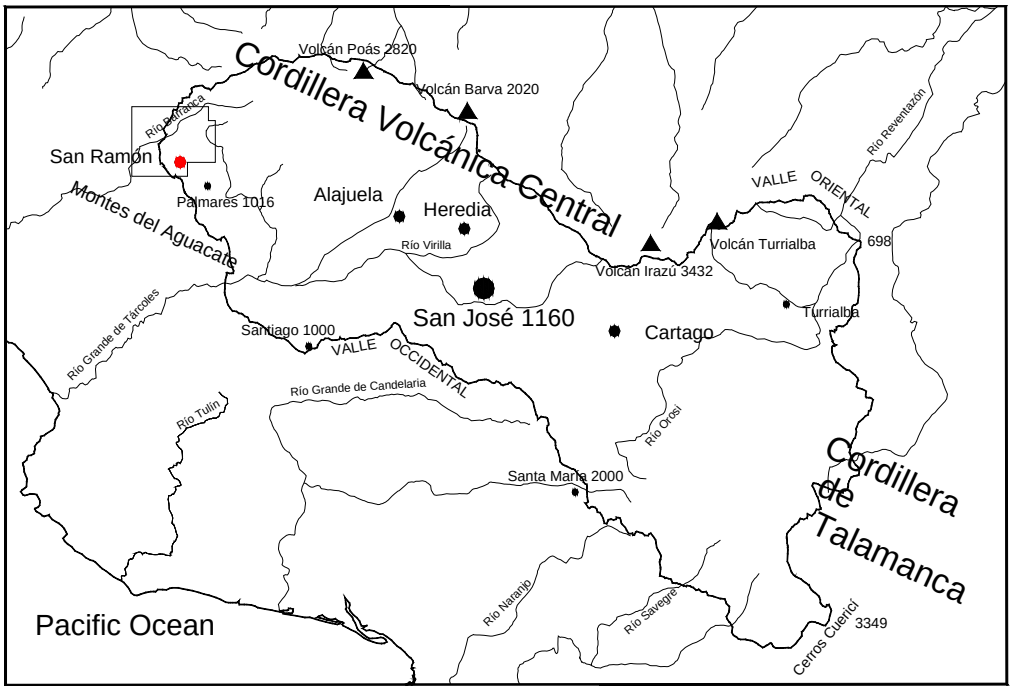


Figure 2.2. Location of the San Ramón region, the Central Valley, and other geographic features (altitudes in m.a.s.l.). Source: Denyer and Alvarado, 2007; Bergoeing and Malavassi, 1982

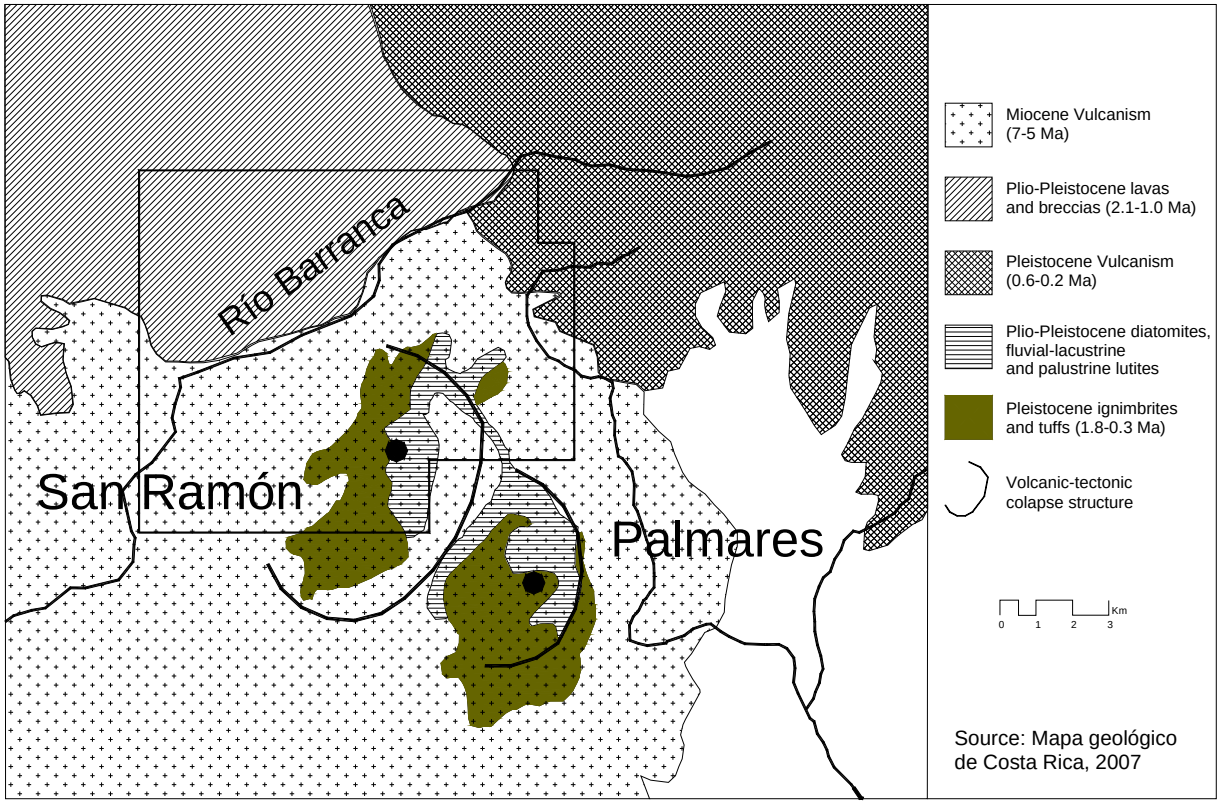


Figure 2.3. Geology and soil origins of the San Ramón region and neighboring localities. Source: Denyer and Alvarado, 2007

Figure 2.4. Examples of Barba ceramic complex found in the San Ramón region

Figure 2.5. Examples of Pavas ceramic complex found in the San Ramón region

Figure 2.6. Examples of Curridabat ceramic complex found in the San Ramón region

Figure 2.7. Examples of Cartago ceramic complex found in the San Ramón region

Figure 2.8. Examples of ceramic from Guanacaste region found in the San Ramón region

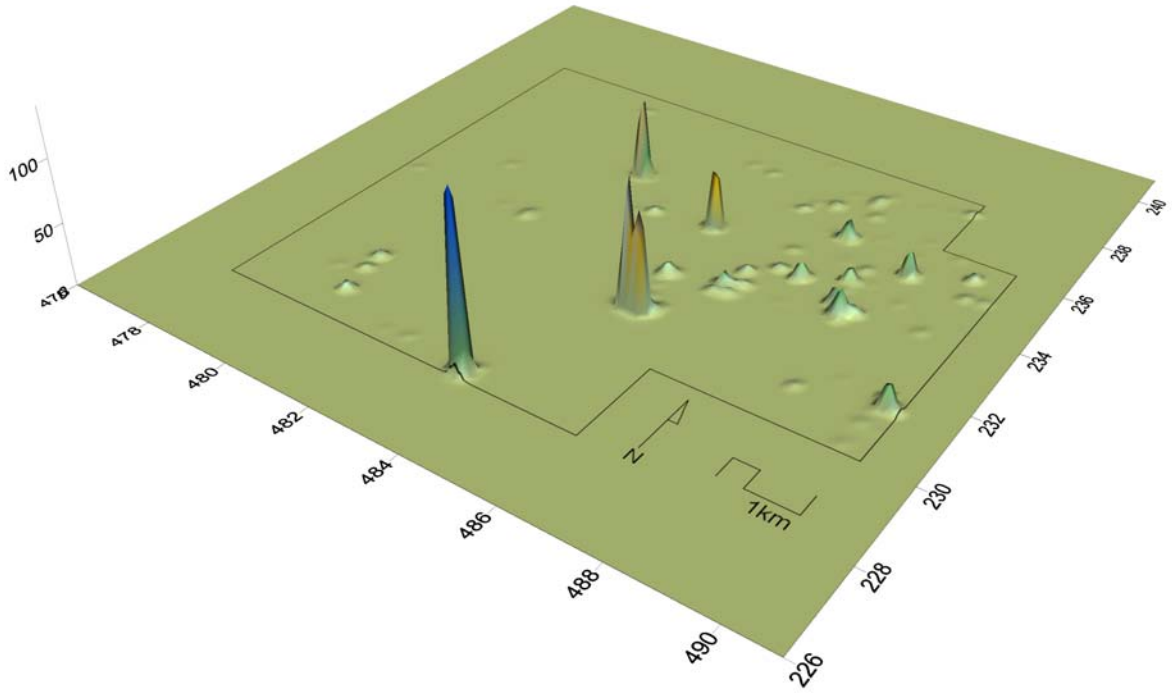


Figure 2.9. Unsmoothed surface representing Curridabat occupation in the San Ramón region

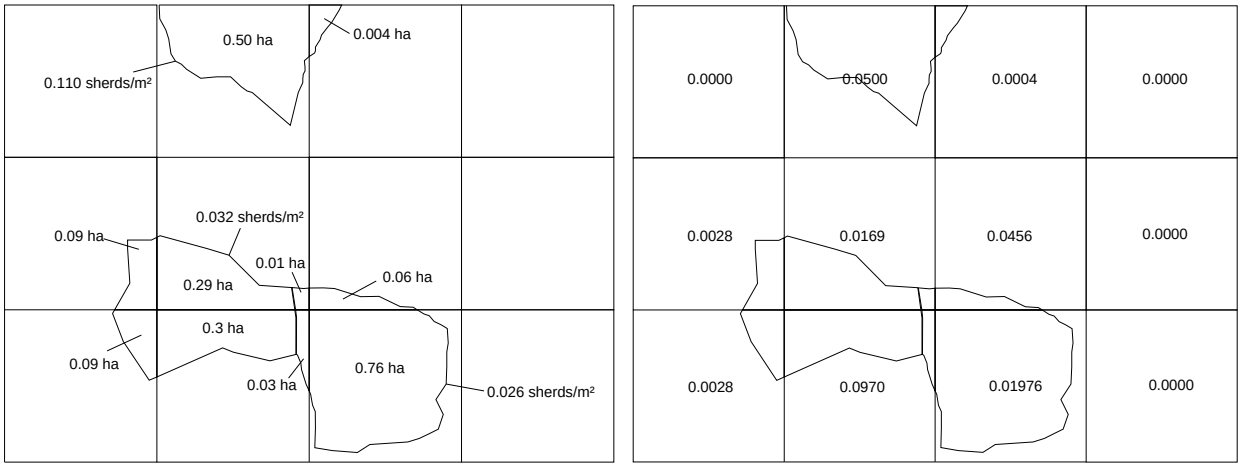


Figure 2.10. Three collection units from San Ramón rasterized into 100-m cells. Final values appear in the center of each cell on the right, based on the surface sherd densities and collection unit areas indicated at the left

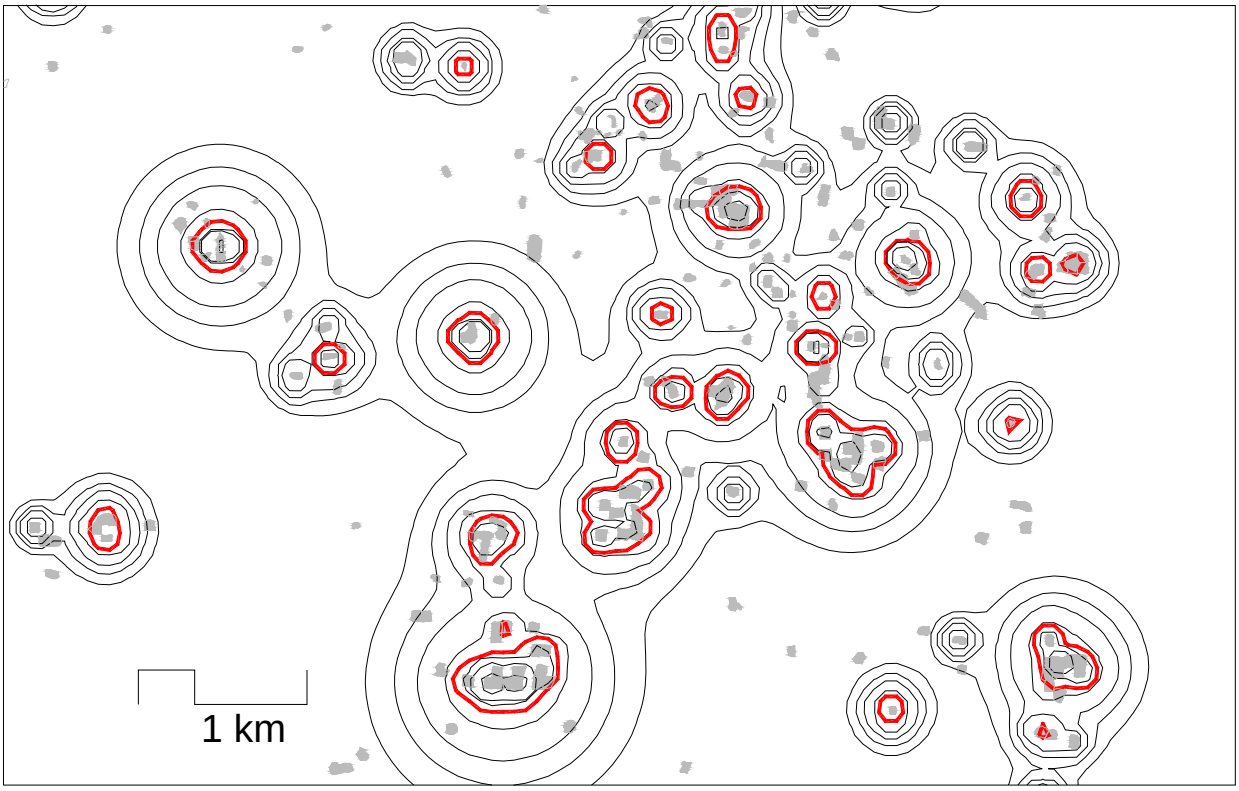


Figure 2.11. Contour map of the occupational peaks in one section of the San Ramón region during the Pavas phase

3.0 REGIONAL DEMOGRAPHIC RECONSTRUCTION

The reconstruction of regional trajectories of prehistoric social change involves outlining processes such as regional population growth and decline, population growth and decline within settlements, population distribution, centralization and dispersion. These processes are strongly related to social change in various ways; for example, knowing how population distributed itself across the landscape provides us with information about patterns of environmental exploitation (including pressure on resources), the nature and change of sociopolitical organization (such as the emergence of chiefdoms), warfare, and other relevant factors. Estimating the population that once occupied a site or a region has been approached from the analysis of settlement data, artifacts, food refuse, soil carrying capacity, burials and/or ethnohistorical data (Blanton 2004; Hassan 1981; Kolb 1985; Paine ed. 1997; Wilkinson and Tucker 1995; Wright 2007). Although these different approaches have been used separately, some archaeologists have found it more useful to use them complementarily (Drennan ed. 2006; Drennan et al. 2003b; Sanders et al. 1979; Storey 1997; Vradenburgh et al. 1997). However, the choice of using one or several of these approaches obviously depends of the kind of data available from the studied region.

The assumption that there is a correlation between population size and settlement space is now widely accepted by archaeologists and serves as the basis for many estimates

available on archaeological groups. Certain aspects of a settlement, such as the number of dwelling units, dwelling space, and site area have been used to estimate population size. Attempts to estimate the size of population units from settlement data are based on the area of a site as determined from the scatter of artifacts (Adams 1981; Kowalewski et al. 1989; Sanders et al. 1979), the number of dwellings (Hill 1970; Longacre 1976; Plog 1975), the volume of site deposits (Ammerman et al. 1976), and the area of house distribution (Wilkinson 2003). In addition to the number of families, family size, and changes in population size through time, behavioral factors such as spatial patterning of activities, social organization, duration of occupation, continuity of occupation, and pattern of reoccupation are known to influence settlement space. Thus, whenever we attempt demographic reconstructions, of course, we must be prepared to deal not in precise figures but in rough approximations, all the while attempting to reduce to the extent possible the sources of error and uncertainty in those approximations. On the other hand, in a region like San Ramón, where the remains of ancient architecture are not complete enough to make it possible to inventory dwellings with any degree of completeness, the principal clue to ancient population levels lies in artifactual remains, and, specifically, in ceramics as the most common and best-preserved constituent of ancient garbage. Thus, to the assumption pointed out above—that there is a correlation between population size and settlement space—it is necessary to add that, other things equal, larger populations leave more garbage on the landscape than smaller populations do. Accordingly, in order to go ahead with the demographic reconstruction it is important to know how equal those other things are, specifically in this instance.

Maps of artifact distribution by period (Figure 3.1) make evident that the settlement pattern in San Ramón was highly dispersed, during its entire pre-Columbian past. These artifact patterns are most probably the only evidence left of small domestic units, located not very far away one from each other, and surrounded by their own cultivated fields. There are several reasons that lead us to this conclusion. Firstly, even though material distribution in San Ramón can still be described as artifact scatters surrounded by empty areas, these empty areas are very often quite narrow and the concentration of artifacts quite small. Certainly, sometimes multiple collection units cluster together forming sites larger than 1 ha (Figure 3.2), but that was the exception in San Ramón instead of the rule. Indeed, this pattern is not present just in certain sectors of the region; the entire region is filled with these scattered small sites. Thus, trying to cluster them together without taking into account the empty spaces that surround them, or the closeness of artifact concentrations, would just create a false impression of population distribution in the region. Secondly, the current settlement pattern in San Ramón is not very different from observed for pre-Columbian times (Figure 3.3); today a great proportion of the landscape of San Ramón comprises small farms dispersed through in the region, farms that not long ago produced most of what the settlers needed for living (Castro 1994). In addition, although San Ramón is nowadays undergoing a rapid urban and population growth, towns in the region have never been big, except of course for the main town. This is not surprising if one takes into account that local towns consisted basically of a small church and a plaza, while the infrastructure oriented to public and specialized services was located in the main town; thus the main subsistence economy has been historically located in the farms, the residencies themselves (Cambronero, ed. 2001; Pineda and Castro 1986). Under those

conditions farmers in San Ramón did not need to leave their farms for subsistence purposes; their presence in towns was limited to participating in feasting and religious activities or when they required specialized services and products. Thirdly, as already described, environmental conditions in San Ramón are quite suitable for a dispersed settlement pattern—high productivity soils spread out in the region, year-round mild temperatures, and plenty of water sources have always provided to the settlers (both pre-Colombian and nineteenth century) a quite open landscape for choosing house locations. Thus, people did not need to live packed in nucleated villages or towns; there were just no practical reasons for them to congregate permanently. In summary, if we take into account the fact that the entire area was surveyed, that artifacts were systematically recorded with a spatial resolution of 1 ha or less, that the scattered pattern is present in practically the entire region, that the productive soils are unrestricted in the region, and that the current settlement pattern in the region is quite similar to the one found in the survey, it seems reasonable to take these artifact scatters as a real phenomenon, not a methodological artifact. The dispersed pattern found in the survey is just the material evidence of thousands of years of human settlement.

3.1 RELATIVE ESTIMATES OF PRE-COLUMBIAN POPULATION

Having examined the broad regional panorama, the next step consists of exploring the two different approaches in regional demographic studies outlined above: the quantification of the locations where the archaeological remains are found, and the direct quantification of the amount of sherds. Here, I am going to use the general proceedings for reconstructing

prehistoric populations recently applied in other regions of the world, such as Colombia (Drennan ed. 2006) and China (Drennan et al. 2003b).

Changing numbers of known archaeological sites from one period to another have often been taken as an indication of changing population levels; however, in a region like San Ramón it seems more productive to take instead collection lots as the minimal unit of observation. This is mainly because, as mentioned above, collection units seldom cluster together forming larger sites. In addition, some sites are larger than others, and thus represent considerably greater amounts of sherds, yet all are counted the same in such an index. Thus, as a starting point for demographic reconstruction for San Ramón region, it seems more reasonable to count, not the total number of sites with ceramics of each period, but the total number of collection units with ceramics of each period. In addition, since collections represent a much less variable area of occupation than sites do (a maximum of 1 ha in principle), this would exclude at least part of the unquantified variation in area. Larger sites will systematically be represented by larger number of collections and thus "count more" than smaller sites. The changing size of occupation through the different periods when a site is occupied is also automatically taken into account. If occupation during one period covers a large area, then sherds of that period will appear in more different collection units; if occupation of the same site in a different period covers only a small area, then the sherds of that period will occur in fewer different collection units (Figure 3.2). The number of collections for each period in the sequence in San Ramón are given in Table 3.1 and graphed in Figure 3.4. The number of collections increases drastically from Barba to Curridabat. Although the increase is slightly less pronounced during Pavas, the number of collections increases almost steadily from the Barba phase until it reaches its peak

during the Curridabat phase. A decrease in the number of collections is clear after the Curridabat phase, which is quite marked; however it should certainly not be taken at this point to suggest a dramatic population decline during Cartago phase.

Even though collection units are less variable in area than sites, they still do vary, nonetheless. In addition, if a large amount of sherds is produced during a period, then the garbage from that period will be found over a large part of the landscape; consequently, an index of the total collection area for each period would gives us a better characterization of the amount of sherds produced during each period than number of collections. Collection areas were measured from the maps digitized from the enlarged air photos upon which field members recorded the limits of the collection units. It was thus possible to add up the total surface area of all collection units in which ceramics of a particular period were present. This information, also included in Table 3.1, is graphed in Figure 3.5. The pattern of change in total area of collection units by period is almost exactly the same as obtained by counting the collection units. The only difference is that, by this measure, the increase in the amount of sherds between Barba and Curridabat is even a little stronger. The decrease seen during Cartago phase is still there, and with the same intensity.

An index of total collection area, however, does not eliminate the possibility of obtaining an erroneous impression of the relative amounts of sherds produced during two periods and, by implication, of their total populations: a large amount of sherds from one period might be highly concentrated in a small total area, while a smaller amount of sherds from another period might be widely spread at low density across a larger total area. In order to avoid relying in any way on where on the landscape the remains of the garbage are found it

is necessary to use a completely different approach. This is the total number of sherds identified to each period in all the collections taken together.

If the amount of garbage left on the landscape is proportional to the number of people who left it, and if the most abundant well-preserved component of prehistoric garbage in San Ramón is ceramics, then the total number of sherds of each period recovered in the region can indicate change population through time. This number also appears in Table 3.1 and is graphed in Figure 3.6. The overall pattern of change in the number of sherds by period is not highly different from the other graphs. There is still a sharp increase from Barba to Curridabat, and there is a change in Cartago. The most notable difference is that, by this measure, Cartago increases modestly instead of declining. The main assumptions required to treat this line as a population index are that the amount of ceramics produced per person does not change very much through time, that survey crews collected ceramics without bias with respect to periods, and that each period represents the same length of time. Certainly, current archaeological phases for San Ramón do not have exactly the same extent; however they only vary by one century, at most. So, correcting the number of sherds for each period by dividing it by 6 (number of centuries in the phase) for Pavas, Curridabat and Cartago, and by 7 for Barba, will not produce a significantly different result. Obviously, as the chronology of the region becomes more accurate the extension of each phase can vary, in this case it might then be necessary to correct the number of sherds for each period.

The broadly similar patterns produced by the two different approaches to quantifying the amount of garbage pertaining to each period suggests that the principal source of the variability all the graphs depict is, in fact, changing ancient population levels, not sampling

vagaries and biases or the impact of dubious assumptions. However, it is important to take into account that the first approach depends basically on the area over which ceramics of each period are distributed on the landscape (number of sites, number of collection units, or total area of collection units), but fails to take into account the different amounts of garbage that may be accumulated. Also, the other approach depends on quantities of ceramics recovered, but fails to take into account that the quantities recovered do not systematically reflect the quantities present. Thus, the best way to deal with this situation is to use a combined index, so as to take advantage of the strengths of each and eliminate their differing drawbacks. This kind of index has been already developed and described by the The Chifeng International Collaborative Archaeological Project (Drennan et al. 2003b: 156-160), and it is based on the quantification of surface artifact densities.

In order to create a density-area index for San Ramón, firstly, percentages of the identified sherds from each collection unit that pertain to each period were calculated. This percentage was multiplied by the surface sherd density for the collection unit to arrive at a surface sherd density for each period for that collection unit. And this surface sherd density was multiplied by the total area of the collection unit to arrive at an area-density measure for that collection unit for each period. For example, collection unit 617 consisted on a systematic collection made by using a circle 2 m in radius. It produced 122 sherds, for a surface sherd density of 9.71 sherds/m². Of the sherds identified to period, 38.5% were Cartago, 60.7% were Curridabat, and 0.8% Pavas. Thus, 38.5% of the 9.71 sherds/m², or 3.74 sherds/m², would be attributable to Cartago; 60.7%, or 5.89 sherds/m² to Curridabat; and 0.8%, or 0.08 sherds/m² to Pavas. The area of the collection unit is 0.98 ha (just slightly under our target maximum size in

this instance), so, taking the systematic collection to represent the ceramics in this area means we count 0.98 ha of Cartago occupation at 3.74 sherds/m², 0.98 ha of Curridabat occupation at 5.89 sherds/m², and 0.98 ha of Pavas occupation at 0.08 sherds/m². This implies that the Cartago population was substantially higher than Pavas but lower than Curridabat; and that the Curridabat occupation was higher than Cartago and much higher than Pavas. When we multiply the density for each period by the area of the collection unit, we arrive at an index that reflects this: 3.70 for Cartago; 5.82 for Curridabat; and 0.08 for Pavas. The units of this index are equivalent to hectares of occupation at a density of 1 sherd/m². That is, a value of 1.000 means 1 ha of occupation at 1 sherd/m². These values for each collection unit were summed to produce an index for the region surveyed for each period, and these results are included in Table 3.1 and graphed in Figure 3.7.

The index we have arrived at shows an overall pattern that is broadly similar to those of the numbers we have considered previously, although there are some differences. According to this index Barba still has a low value, as a result of the highly sparse material in the landscape and the very small areas where it is located. The main difference is present in Pavas, this phase shows an especially low value here, which indicates the low densities of material located found over quite small areas. The steep demographic growth in Curridabat, also represented in the other graphs, is also clearly evident in this graph; and because of the lower value Pavas shows here, population growth during Curridabat it is even more striking. Cartago this time again represent a substantial population decline. In the calculation of this index for a given period, large sites are taken to represent more population than small sites; and sites with high densities of sherds on the surface represent more population than sites with sparse sherds. Although the

general pattern of artifact distribution for San Ramón can be described one of small, sparse sherd scatters, that description finds its extreme expression in the fist two phases—Barba and Pavas. Thus, the tiny, highly sparse sherd scatters found in these two phases result in such a low index for these two phases, precisely because they are so small and produce so few sherds.

The most important assumption involved in this index that remains unevaluated for San Ramón region is that the amount of garbage (i.e. ceramic sherds) produced per person per year is approximately the same throughout the sequence. Whether this is true or not can be investigated through stratigraphic tests, which offer the possibility of assessing occupation spans more precisely than from surface collection and of estimating populations on some other basis, such as remains of dwellings, and thus of comparing these estimates to quantities of ceramics. If the amount of broken pottery produced per person per year appears to differ from period to period, it is easy enough to add another variable to the calculation of the index that recognizes this difference. This task remains for the future.

This demographic index is, of course, a relative one. That is, a lower value indicates a lower population, and a much lower value indicates a much lower population, but it does not tell us how many people lived in the surveyed region at any point in time. The relative demographic index is highly suitable for conversion into such absolute estimates; however, it simply needs to be multiplied by a figure approximating how many people will leave a density of surface remains averaging 1 sherd/m^2 across an area of 1 ha in a century, and that is precisely what the next section is about.

3.2 ABSOLUTE ESTIMATES OF PRE-COLUMBIAN OCCUPATION

The estimation of absolute regional population requires the use of different lines of evidence such as floor area, settlement area, and accounts of indigenous population density from local Spanish chronicles and from cross-cultural studies. This kind of data provides us with general density figures relevant to the kind of societies studied here; these figures, combined with the relative indexes already derived, takes us as close as we can currently get to the approximate actual number of people who inhabited the region, during each pre-Columbian phase.

The study of floor area and settlement area implies the use of horizontal excavation and the exposure of residential structures. It would be ideal to have this kind of information for the region under research; however for the San Ramón region this scale of analysis has not yet been undertaken. Even so, it is still possible to look at partially excavated settlements nearby, within the Central archaeological region—specifically from the Central Highlands and the closest area to San Ramón, the Central Pacific—and calculate floor areas in relation to excavated areas. Archaeological work focused on the partial exposure of settlements in the Central region has largely privileged villages from late periods with monumental architecture. This kind of settlement is the most conspicuous on the surface, not only because of the presence of earth mounds, cobble-stone rings and pathways, but also because such sites usually also have high sherd densities.

This type of settlement is also present in the San Ramón region, one example is Barranca. Although Barranca site was located in the 1970's (Linares 1975: 239) the site is still virtually unexplored. A brief incursion in the 1980's (Rojas 1995: 30) documented the presence

of cobble-stone pathways and earth-mound foundations surrounded by stone rings, the disturbed house foundations are still visible across the surface (Figure 3.8). This monumental architecture from the settlement was preliminary assigned to the period 600-1550 A.D. (Chávez 1994a: 30), given the presence of ceramics from Curridabat and Cartago phases in the site. Another example is Volio where a house foundation was partially excavated two decades ago (Rojas 1995, 2008): a cobble-stone ring defined an area of approximately 154 m². Although Volio site was occupied from 300 B.C. to 1550 A.D. (Chávez 1991a, 1994a; Rojas 1995), the architectonic complex of Volio site was assigned to the period 400-1550 A.D.; this by relating ceramics from that period to the monumental architecture (Chávez 1994a; Rojas 1995; 2008). The research here presented has clarified some aspects of how the extension and population density of these two sites (as well as all the settlements within the region) changed over time. These results are introduced in the next chapter. For now it is relevant just to indicate that these two sites are among the sites in the region with the highest sherd densities.

Commonly the kind of settlement present in Volio and Barranca has both large and small structures. Historic and ethnographic accounts about the use of large *palenques* or houses by the indigenous population in this part of the world tell us that the norm in these societies is that large houses were used by extended families (Ibarra 1990: 46-61). Indeed, the description by the conquerors of extended families or multiple families inhabiting large houses was not limited to a small region; it is found in a number of accounts from the territory today known as Costa Rica and the south of Nicaragua (e.g. Artieda y Chirino 1907 [1590]; Fernández de Oviedo 1855 [1556]; Vásquez de Coronado 1976 [1563]). If the available data about floor area comes from late period settlements then historic information from the sixteenth century

becomes a relevant line of evidence in order to approach a population density estimate; especially if that data comes from observations made very close to the study region. In 1566 the Spanish conqueror Juan Dávila wrote about the region between Garabito and Votos (Figure 3.8). Garabito was a town located just 8.5 km southwest of the surveyed region, near the settlement today known as Esparza (Ibarra 1990: 51; Lines and Meléndez 1961: Map 3; Solórzano 2000: 69). This is just 3 km away from the archaeological site known as Jesús María. The indigenous people known as Votos by the Spanish conquerors were located in the foothills of the Poás Volcano and the Tilarán highlands (Fernández 1883: 305-306 [Footnote 2]) just north of the San Ramón region.

In his account Dávila mentions that:

> [Francisco de Marmolejo]…only managed to see two houses, one large and the other not so much; the biggest, he said, was two hundred *pies* long and forty *pies* wide. When I [Dávila] found out about certain Indians brought by some soldiers, they told me that in those two houses live up to ninety or one hundred Indians, and that the biggest was the house of the lord. I asked them if there were more houses and they answered yes, but they were far away...
> [In a town in Garabito region]…there were up to twenty Indians, thirty women, and up to fifteen or sixteen boys and girls. They lived in two not very large houses… (Dávila 1883 [1566]: 37-38; my translation)

A Spanish *pie* is equal to 0.27863 meters, which means that the area of the large house from the first description by Dávila is 621 m². Assuming that the other house's size was somewhere between half and three-quarters the size of the large one, and some 95 people lived in the two structures, there was between 0.1 and 0.08 person per roofed square meter. This figure is almost identical to the famous number of one person per 10 m² (Naroll 1962; LeBlanc 1971). Assuming that—in the second description—each of the "two not very large houses" was approximately half the size of the large house in the first description we have a

population density of, once again, approximately 0.1 person per square meter (65 people/620 m^2).

The closest site to San Ramón where habitation structures have been completely exposed is Jesús María (Solís 1991; 1992), located just 13 km southwest of the surveyed region (Figure 3.9). The site was a small village of seven houses (one structure had been completely disturbed, so it was not included in this analysis); house delimitation was clear because of the use of cobble-stones in each house's foundation. Although both Pavas and Cartago artifacts were found in the excavations, the architectural features correspond only to early Cartago phase (1000-1350 A.D.). Altogether, the residential zone revealed by excavations totals about 5496 m^2 or 0.549 ha. Three of the houses were circular, having a floor area of 234.3 m^2, 78.5 m^2, and 234.3 m^2; the other three were rectangular with areas of 41.3 m^2, 32.5 m^2, and 17.5 m^2. Thus, total floor area in Jesús María is 638.4 m^2. Allowing between 0.08 and 0.10 person per square meter of roofed area, it means a minimum of 51 and a maximum of 64 people in 0.55 ha.

Another nearby and partially excavated site is La Fabrica, located in Grecia de Alajuela, 16.5 km east of San Ramón (Figure 3.9). The occupation of the site goes from 300 B.C. to 1550 A.D. However, the period when the monumental architecture was built and used includes Curridabat and Cartago phases, Curridabat being the period when presumably the settlement was mostly inhabited and extensively used (Guerrero 1980, 1985; Snarskis 1981a: 58-59). Four hectares of the site were partially excavated and 13 circular cobble-stone foundations were found (Guerrero 1980: 6; 1985: 34). Of the 13 residential features the dimensions of four of them are given (Guerrero 1980: 6-9); the dimensions of the other houses were measured

directly from the map of the site (Troyo 1998: 33). The total floor area sums to 886.5 m²; at between 0.08 and 0.10 person per square meter of roofed area this is between 71 and 89 people.

Excavations at the site CENADA, located just between Alajuela and San José (Figure 3.9), exposed an area of 10,000 m² (Gutierrez 1986: 257). Eight earth-mound house foundations were found, in addition to other specialized features. The house foundations correspond to a residential area which dates to the Cartago phase (Blanco and Salgado 1980: 133). Of the eight mounds, the dimensions of six of them are given (Rojas 1998); these total 900.6 m². In addition, from the sketch map of the site (Gutierrez 1986: 264) it is possible to notice that the partial shape and perimeter of one of the two mounds without reported dimensions (M-4) are quite similar to those of M-7, which has a radius of 8.5 m. Assuming that M-4 has dimensions similar to those of M-7, we have a floor area of approximately 1127.5 m², which translates into between 90 and 113 people, again at 0.08 and 0.10 person per square meter of roofed area.

Pozo Azul is a site located in the Río Parrita valley, in the Central Highlands piedmont, south of Santiago de Puriscal (Figure 3.9). The settlement was occupied from 300 to 1550 A.D., but the monumental architecture—including pathways, cobble-stone walls, earth mounds, and cemeteries—has been mainly associated with the Cartago phase (Corrales 1992, 1996: 107-110). The 22 residential features of the settlement are distributed within an area of 10.5 ha. Their area totals 1511.4 m², which makes a minimum of 121 and maximum of 151 people, again at 0.08 and 0.10 person per square meter of roofed area.

Another settlement with residential architecture mapped is Agua Caliente, located 2 km south of Cartago, in the Valle del Guarco (Figure 3.9). It was occupied for 1800 years, but its

most intense occupation was during 800-1550 A.D. (Peytrequín y Aguilar 2007, Valerio 1991; Vásquez 1991). During that period the settlement had two sectors, a habitation area and a cemetery section attached; the residential area is within 14.87 ha of the settlement. The floor areas from the 12 habitation structures mapped totals 400.1 m², which translates to between 32 and 40 people, again at 0.08 and 0.10 person per square meter of roofed area.

Guayabo de Turrialba is a settlement located in Turrialba, just on the limit between the Central Highlands and the Caribbean watershed (Figure 3.9). Although the detected occupation in the area ranges from the period 1000-300 B.C. until just before the Conquest, the monumental architecture present in the settlement is linked to Curridabat and Cartago phases. Again, these two periods are the ones with the highest sherd densities (Fonseca and Hurtado de Mendoza 1984). The area of the residential area exposed from 1968 to 1980 totals 5.1 ha, and the house floor area adds 5075.2 m². This is between 406 and 508 people, again at 0.08 and 0.10 person per square meter of roofed area.

The estimation of the number of people per hectare for each settlement is detailed in Table 3.2. It is evident that three sites have a similar number of people by hectare: Jesús María (between 116 and 93 persons), Cenada (between 113 and 90 persons), and Guayabo (between 99 and 79 persons). If we assume that the highest residential densities recorded in San Ramón were of the order of these three settlements, we have a starting point to relate the San Ramón relative population index to the estimated absolute population for the settlements from the neighbor regions. The top of the San Ramón surface sherd density is 16.3 sherds per m²; only about 0.5% of the collection units exceed this density. If we take around 16 sherds per m² to represent a residential density of around 100 persons per ha, then these numbers can be scaled

up or down proportionally for collection units with higher or lower surface densities of sherds. The scale used for estimating a maximum number of people by phase is shown in Table 3.3. Looking at the table, the factor by which each density value needs to be multiplied to obtain the equivalent number of inhabitants in 1 ha is approximately 6 (100/16). This same factor can be applied to the relative population indexes for any collection unit or to the total for the period. However, it is important to recognize that these estimates are very approximate. Many settlement studies that estimate populations have given a maximum estimate that is about two times the minimum (e.g. Adams 1981; Drennan et al 2003b; Langebaek 1995; Parkinson 2006; Wilkinson 2003; Wilkinson and Tucker 1995; Wright 1981, 1997), following that practice and I have used a minimum factor that is about 1/3 below the estimate of 6 and a maximum factor that is about 1/3 above it, which would be 4 and 8. Thus, for San Ramón I will give a maximum estimate that is two times the minimum, consistent with a broad consensus about how approximate such estimates are.

Applying the factors to the total relative population index for Cartago (246.71 X 4 and 246.71 X 8), yields a minimum population estimate for the area surveyed of 987 persons and a maximum estimate of 1974 persons. For Curridabat phase (322.37), we arrive at a minimum population estimate for San Ramón of 1289 persons and a maximum estimate of 2579 persons. For Pavas phase (32.33), the minimum population estimate is 129 persons and the maximum estimate is 259 persons. Finally, for Barba phase (0.11), the estimation of population for the area surveyed is 1 person. This means that the entire region was inhabited by only 1 person averaged out across its 700 years. What this means, of course, is that, while utilization of the region in Barba times can be detected, it was extremely sparse and sporadic.

These estimated numbers of inhabitants tell us the same general story as the other ways of looking at the data: almost no people in the Barba phase, a modest increase during the Pavas phase, a huge increase during the Curridabat phase, and a modest decline during Cartago. In addition, thinking again about sherd density, evidently San Ramón occupied areas have quite low artifact densities in comparison to, for example, Mesoamerica. Sherd density in San Ramón is equivalent to what in Mesoamerica (Sanders et al. 1979: 38-39) has been described as "scanty" (for most San Ramón occupation during all the phases) to "scanty-to-light" (for the highest densities in San Ramón for the last two phases). In Mesoamerica such a density figure translates to 2-5 people per hectare (Sanders et al 1979: 39), the equivalent of one nuclear family living in a hectare. Interestingly this figure corresponds very well to the pattern of very small occupation areas (no bigger, or just slightly bigger, than a hectare) scattered around most of the San Ramón region during every period. These probably correspond to widely scattered single family residences. The exception to this pattern in San Ramón is the compact villages represented by the densest areas of occupation during the last two periods.

Table 3.1. Various ways to quantify the amount of pre-Columbian artifacts on the surface in the surveyed region by phase

Phase	Number of Collections	Area of Collections (km²)	Number of Sherds	Number of Sherds per Century	Density-Area Index
Barba	22	0.1136	34	5.6	0.11
Pavas	336	2.1103	4221	703.5	32.33
Curridabat	541	3.6995	8331	1388.5	322.37
Cartago	485	3.3477	8674	1445.6	246.71

Table 3.2. Estimation of the average of amount of people by hectare in the Central Region

Site	Settlement Area (ha)	Floor Area (m²)	Number of People (Minimum)	Number of People (Maximum)	Number of People in a Hectare (Minimum)	Number of People in a Hectare (Maximum)
Jesús María	0.55	638.4	51	64	93	116
Cenada	1.00	1127.5	90	113	90	113
Guayabo	5.14	5075.2	406	508	79	99
La Fábrica	4.00	886.5	71	89	18	22
Pozo Azul	10.50	1511.4	121	151	12	14
Agua Caliente	14.87	400.1	32	40	2	3

Table 3.3. Scale used for estimating a maximum number of people by phase according to the maximum sherd density by phase

Sherds/m²	# People/ha	Cartago s/m²	Curridabat s/m²	Pavas s/m²	Barba s/m²
			16.3		
16.0	101				
15.3	96				
14.3	89				
		14.5			
13.0	78				
12.3	75				
8.2	52				
4.1	26				
				3.6	
3.1	20				
2.0	13				
1.0	7				
0.5					
0.0	0				0.2

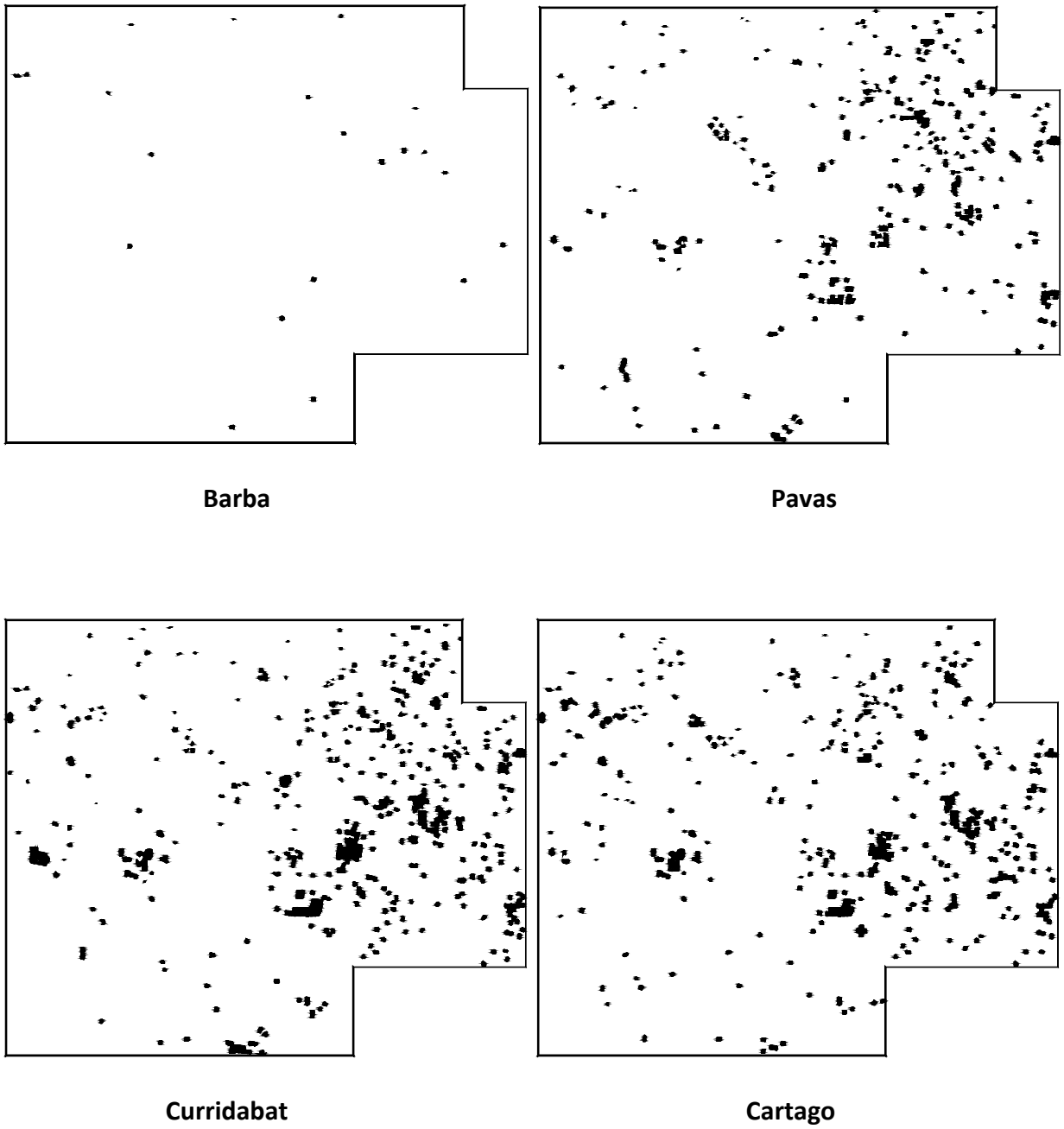
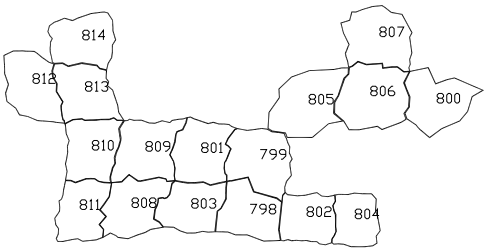
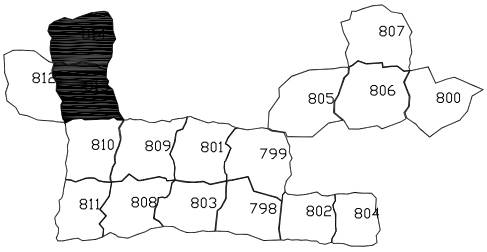


Figure 3.1. Pre-Columbian occupation of the San Ramón region, period by period



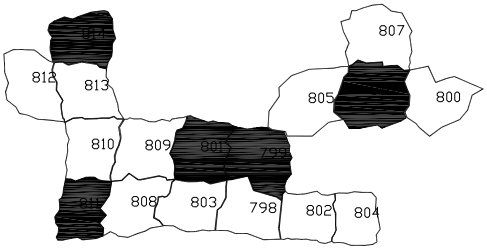
Site



Barba

Pavas

Curridabat



Cartago

Figure 3.2. An example of how several collection units comprise a single site, and the changing pattern of occupation through time of the same site

Figure 3.3. Modern settlement distribution in San Ramón de Alajuela. Source: Instituto Geográfico Nacional

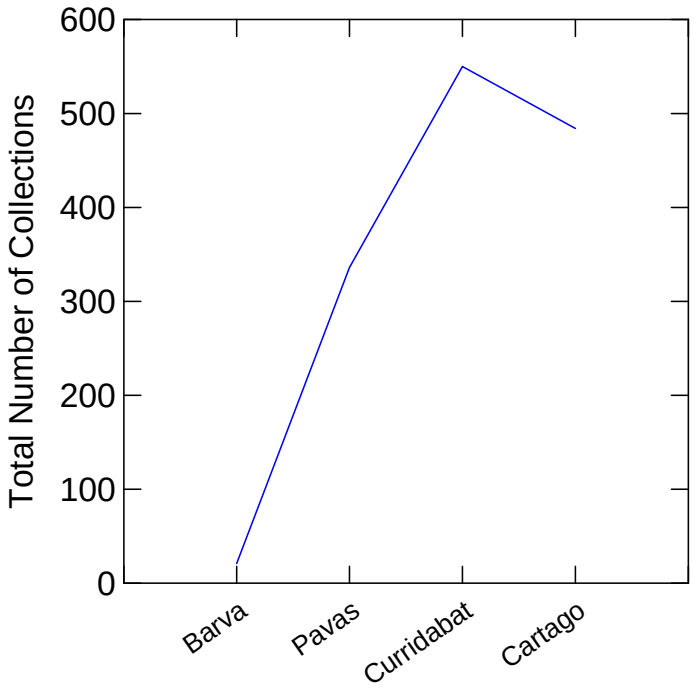


Figure 3.4. Total number of collections in the San Ramón region by period

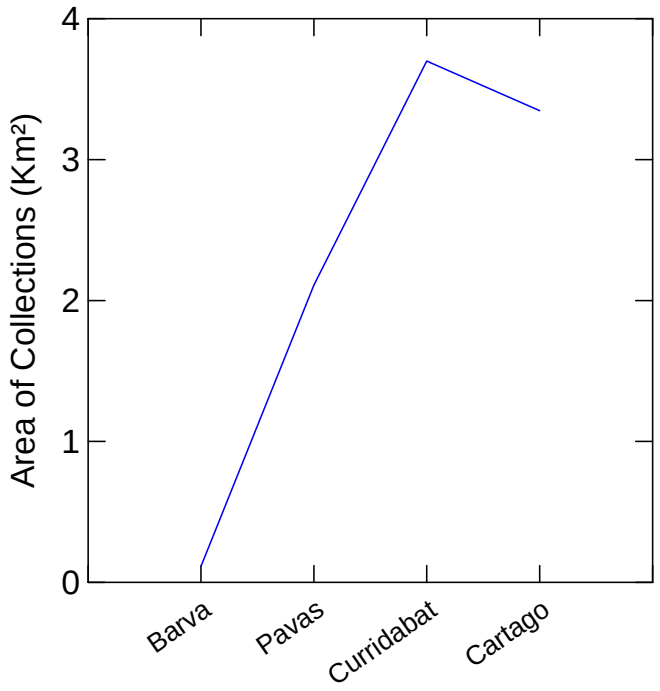


Figure 3.5. Total area of collections in the San Ramón region by period

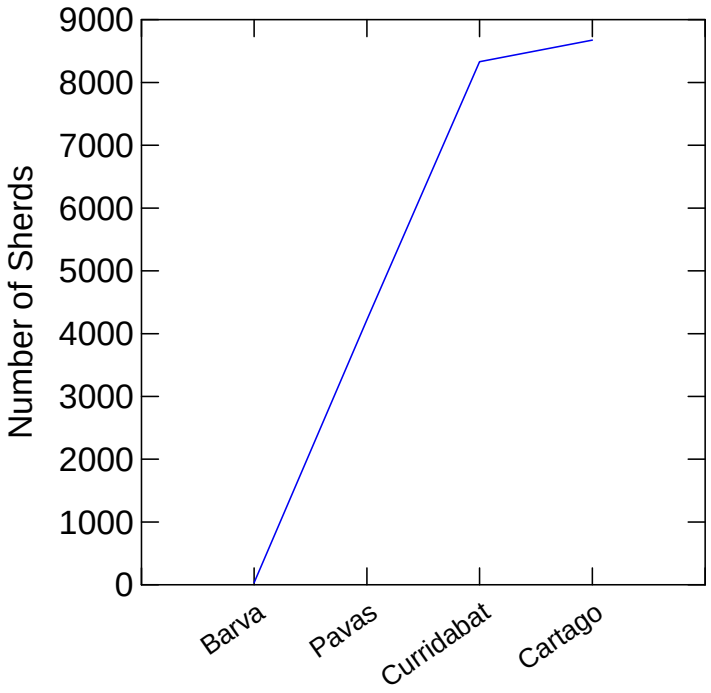


Figure 3.6. Total number of sherds recovered from the San Ramón region by period

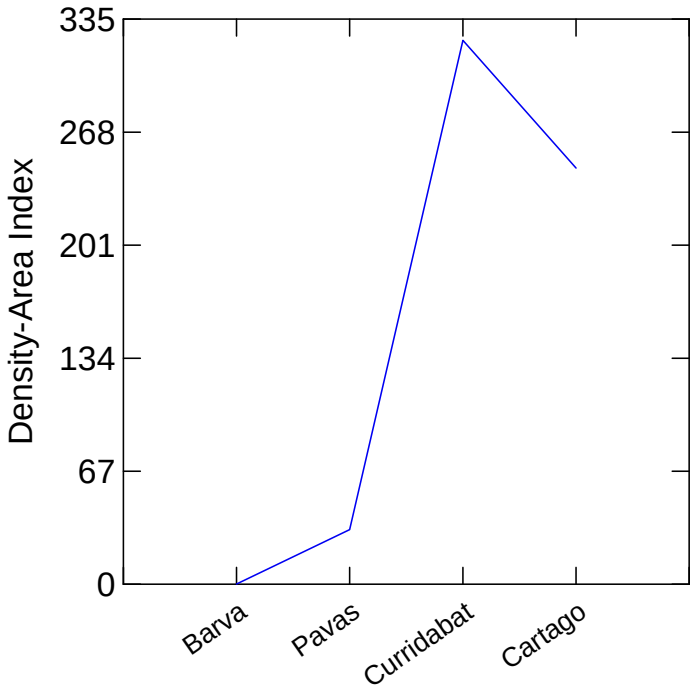


Figure 3.7. Density-Area Index for the San Ramón region by period

Figure 3.8. Barranca, notice the disturbed earth mounds and the stone used as foundation material

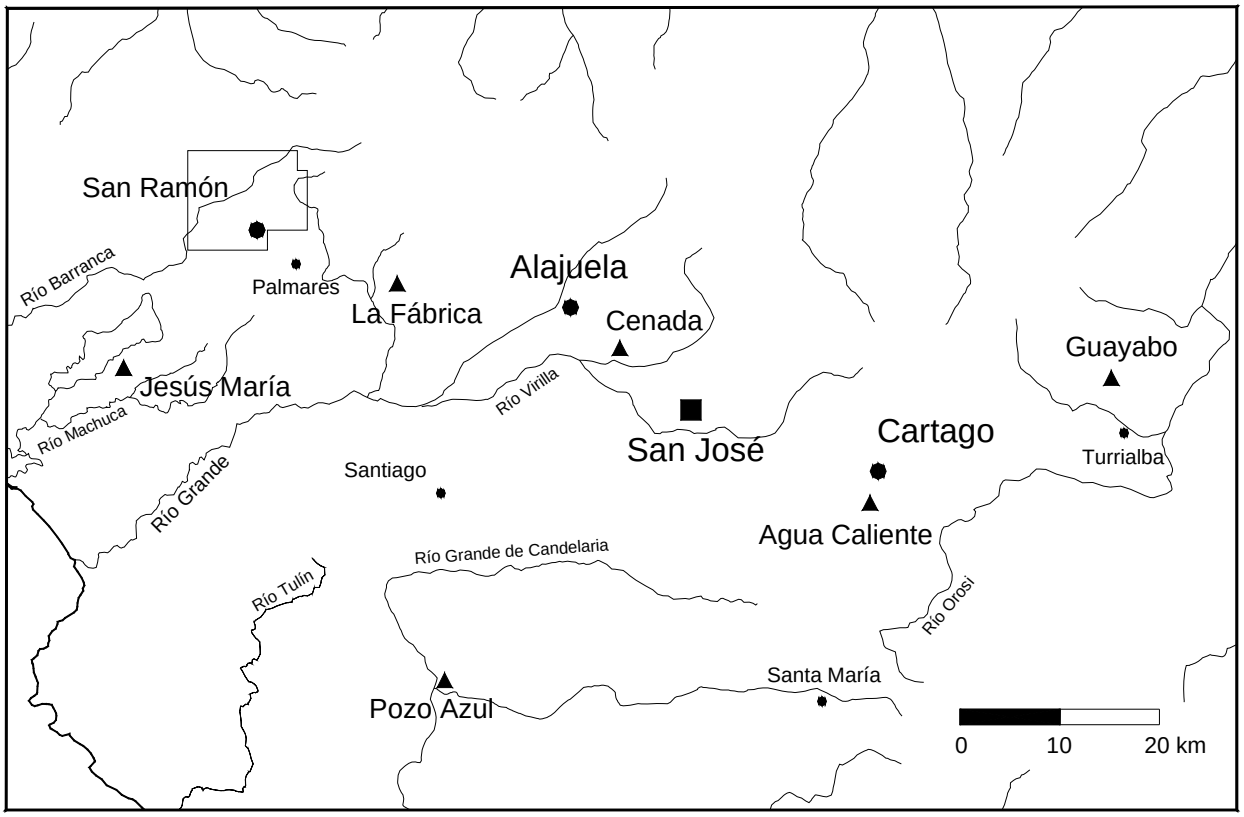


Figure 3.9. Location of settlements with mapped structures within the Central Highlands and Central Pacific regions

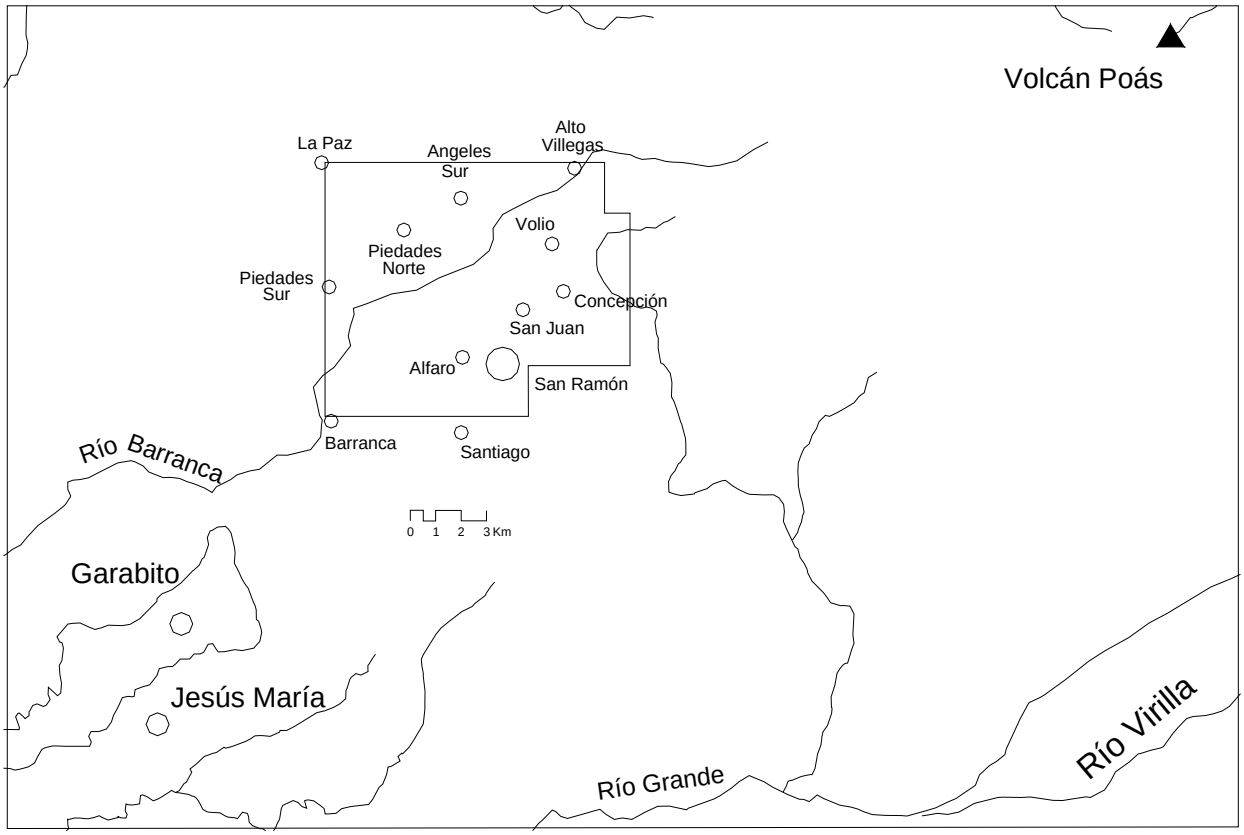


Figure 3.10. Region from where Dávila's descriptions of indigenous towns in 1566 come from, in relation to the San Ramón region, current towns, and Jesús María archaeological site. Sources: Ibarra 1990: Map 4; Lines and Meléndez 1961: Map 3; Solórzano 2000: 6

4.0 SOCIOPOLITICAL CHANGE IN SAN RAMÓN DE ALAJUELA

At least since Morgan's (1877) and Bastian's (1883) interest in the origin of certain cultural and psychological features by looking at their geographic distribution, the relationship between political, ideological and economic phenomena and the distribution of people on the landscape has been a classic topic in the anthropological and archaeological literature. More concretely on ancient social change research, cross-cultural studies have recognized a very broad relationship between population size and societal complexity (Carneiro 1967; Ember 1963; Feinman and Neitzel 1984; Narroll 1956). Furthermore, the study of how different demographic variables (societal population, degree of nucleation, community size, population density) relate to each other (or do not) and how they change through time can help us to understand how social and political dynamics worked and were modified alongside the trajectory of social change in a given region (Drennan 1987; 1991). This is why nowadays, independent of the cause-effect relationships stressed by different researchers, demographic studies kept being a central issue in the study of social change (e.g. Baker and Sanders 1972; Chamberlain 2006; Clarke 1977; Feinman 1991; Netting 1990; Kertzer and Fricke 1997; Murdock and Wilson 1972; Renfrew 1975; Zubrow 1976).

The demographic analysis accomplished in Chapter 3 provides us with the quantitative basis for exploring the formation and development of pre-Columbian societies in San Ramón de

Alajuela; and because of the way the data was collected—through a systematic, regional full coverage survey—we can study those issues at both the regional and local scales. The approach followed here for reconstructing the pre-Columbian trajectory of community organization change of San Ramón is the one proposed by Peterson and Drennan (2005). The reason why this approach was chosen has to do mainly with the theoretical and methodological tools this approach provides to the archaeologist. In contrast to other approaches that conceive social change primarily as change in the minds of individuals (e.g. Hodder and Hudson 2004) and therefore immaterial, or as change in the material record (e.g. O'Brien and Lyman 2003), or as a quest for ideal "memetic" and biological reproductive strategies (e.g. Shennan 2002), social change is understood here as changes in the way that social and political dynamics manifest themselves through structures of human interaction, at different scales in a given region. Thus, social change can be studied by looking at how social entities such as local communities (Murdock and Wilson 1972) and larger, supra-local communities emerged—or did not—and how they changed through time. The first step in pursuing this goal is to go beyond the operative concept of site by focusing the social nature of each settlement or cluster of settlements (houses, rural population, hamlets, villages, districts, etc.). Peterson and Drennan (2005) provided the methodological tools for capturing and studying that social nature. Thus, by taking into account not only settlement proximity (as most approaches to community definition do) but also systematically defining settlement clusters according population densities and by estimating the numbers of people each community contain (see Chapter 2) it is possible to discuss these communities more realistically. It is also possible to detect regions and periods in which social interaction was not structured by communities. Where communities existed, it is

also possible to know when those communities emerged and to understand their changes in their scale through time. Where they did not, it is still possible to know approximately how large the regional population was, and to explore the changes in the general dispersed pattern. These tools allow the archaeologist to go further with data analysis and therefore to generate stronger empirical observations, all resulting in more advanced sociopolitical interpretations.

4.1 LOOKING AT VARIATIONS IN GENERAL SETTLEMENT PATTERNS

In the last chapter we already explored the issue of settlement distribution. We arrived to the conclusion that the location of the population in San Ramón can be described as highly dispersed (Figure 3.1), and that conclusion is equally valid for the entire pre-Columbian period or for each phase separately. However, even though the general pattern of settlement distribution in San Ramón can be described as dispersed, there are differences in how dispersed the settlements are—both for each period synchronically, and for comparison of different phases.

Looking again at the settlement distribution (Figure 4.1) it is possible to see that in Barba there is indication of a few single houses or camps dispersed all around the region (Figure 4.1a). There are not clusters of houses near others forming hamlets or small villages. During Pavas the situation changed considerably (Figure 4.1b) it is possible to see that some houses cluster together forming hamlets and small villages, mainly on the eastern side of the region. These clusters are still small and quite dispersed, and a great proportion of the region is still occupied by single houses quite widely spread out. This seems to represent the origins during

this phase of a “rural” population. This population is now rural in the sense that it is located apart from the groups of population that had just emerged in the region. During the Curridabat phase (Figure 4.1c) house clusters became bigger and more compact. By comparing the spots encircled in the figures for the Pavas and Curridabat phases it is possible to see that all the clusters, except for one, increased notably in size. The rural population seems also to increase in number, although not by nearly as much as the populations in the local clusters. Looking at the general settlement distribution of the region during this period it is noticeable that the broad pattern across the region practically does not change from Pavas times. The eastern side keeps being more populated than the western side, and the population clusters that emerged during Pavas are practically the same as those identified during Curridabat. The location of the rural population is also quite stable; small changes can be perceived mostly at the southwest of the region. Finally, for the Cartago phase (Figure 4.1d) the general settlement distribution continued to be quite similar to the previous two phases. During this phase the population living in more nucleated fashion occupied less space in almost all the areas encircled, but this decrease in occupied area is moderate. Also, the rural population shifted, with many houses occupied during Curridabat abandoned or relocated and many others new ones built during Cartago. At the end practically the same number of rural houses that existed in Curridabat are present in Cartago, but they are in different spots from the earlier phase. Also, an increase in population towards the northwest section of the region is manifest during Cartago phase.

Evidently the decision of how close or how far apart people want to live from each other depends on different circumstances. One of the obvious ones is the regional availability of natural subsistence and other resources. For San Ramón, as explored in Chapter 2 and Chapter

3, the distribution of fertile land, water, and other natural resources is broad enough that it should not have ever imposed significant limitations to settlement location, especially taking into account the modest size of the entire population in any given phase, and its wide distribution. Even if one calculates the population density of San Ramón using the maximum number of inhabitants for Curridabat (23 persons/km²), the phase with the highest number of people during pre-Columbian times, the number is still well under the population density for the surveyed region in 1950 (around 30 persons/km²) (Observatorio del desarrollo/Universidad de Costa Rica 2008) when the region was completely oriented towards subsistence economy. Another important variable has to do with economic practicality; other things being equal, it should be expected that farmers locate their residences directly on the land that they farm so as to minimize the effort involved in traveling from their homes to their fields (Chisholm 1970), especially when people dedicate themselves almost exclusively to intensive agricultural pursuits (Drennan 1988). This practice would produce precisely the pattern of households broadly spread across the landscape that we see for the region under study. However, even when the general pattern of settlement distribution for each phase in San Ramón is dispersed, we just saw that there are actually some houses that cluster together. Looking at the settlement distribution maps (Figure 4.1), it is clear that during the last three phases some people indeed congregated and lived relatively close to each other. Thus, in order to understand the nature of these clusters it is necessary to look at other factors besides settlement distribution.

As geographers (Haggett 1965: 35; Olsson 1965: 44-48; Steward 1941) and archaeologists (Johnson 1977: 495-501; Hodder and Orton 1976; Peterson and Drennan 2005: 8; Plog 1976: 256) have recognized in the last forty years, separation distance is not the only

relevant variable when looking and defining sociopolitical entities, the size of the population is also a significant factor in determining the degree human interaction, and therefore the nature of settlement clusters. The general principle of the so called "gravity models" is that the larger the number of people concentrated in a given spot the stronger the pull exerted on the people living around; consequently small groups will pull few towards them. Sedentary people are usually involved in an assortment of communal activities with other members of their societies, and such activities are facilitated to the degree that they live close to each other; thus, dispersed settlements will be more likely to be pulled towards larger communities because of purely practical reasons (e.g. transportation and communication). Other things equal, more people produce more interpersonal interactions. Consequently, one step further to understand the social dynamics in the pre-Columbian trajectory of San Ramón de Alajuela is to look at both—variations of settlement distribution and population size simultaneously within the region, and for each of its phases.

As discussed in Chapter 2, it is possible to delimit settlement clusters systematically by representing the distribution of people across the landscape as a surface whose elevation is proportional to local population density. This tool allows us to recognize local communities (hamlets, villages) and supra-local or large communities (districts, rural population) (Peterson and Drennan 2005). The other analytical tool required is the density-area index. In Chapter 3 this index was estimated for the entire region and for each phase; in this chapter it was estimated for each settlement and for each settlement cluster delineated in the contour maps and multiplied by the maximum and minimum population conversion factors already estimated for San Ramón (4 and 8). By doing this it is possible to obtain a range of how many people these

clusters and the rural population consisted of. This makes possible determination of whether a settlement or settlement aggregation represents just one, two, or three families (around 5 to 12 people) living together, or four to ten families (around 16 to 40 people) forming a hamlet, or twelve or more families (more than 40 to 48 people) living in what it can be described as a small village.

4.2 UNDERSTANDING THE SOCIOPOLITICAL PANORAMA, PHASE BY PHASE

4.2.1 Barba Phase (1000-300 B.C.)

It was already discussed that the settlement pattern for Barba phase can be described as just a few houses spread out through the entire region (Figure 4.2). People preferred to live between the 1000 and 1100 m.a.s.l., but it seems that there was not a preference between flat and steep locations. Some houses are located next to rivers and others not, but everyone lived within 1 km from a river. Looking now at absolute numbers of people for each domestic unit, each identified occupation locale is estimated at no more than one person; and as we already know, the entire region is estimated at no more than one person in the 700 years of occupation. This means that the 21 occupation locales found in the entire region were occupied sporadically during the 700 years, and not all simultaneously. This implies that San Ramón was practically uninhabited during the entire phase; however there is another explanation for this pattern.

The period that goes from 1000 to 300 B.C. has been traditionally interpreted in the archaeology of Costa Rica as the first time when village life and agricultural production was

entirely adopted—the period that immediately came after a long process of gardening and cultivation adaptation, and of abandonment of a mobile settlement pattern (Chávez 1991b: 30; Corrales 2001: 21-29; Fonseca 1992: 113-119; Fonseca and Cooke 1993: 238-241). However, independently of the issue of when and how agriculture was adopted in this part of the world, it is likely that sedentary life was not adopted in every single region during the period encompassed by Barba phase. In San Ramón a few small bands might have inhabited the region during this time, and the settlement remains found in the region could have been actually the remains of temporary camps created by mobile groups instead of permanent dwellings inhabited by sedentary cultivators. There is historical and prehistoric evidence of mobile and semi-mobile groups adopting and using ceramics, in different parts of the world such as Colombia (Politis 2007), Chile (Cornejo y Sanhueza 2003), Mexico (Graham 1993), Kenya (Hodder 1982) and Argentina (Politis, Martínez and Bonomo 2001). This might explain the very small quantity of the remains and the apparent small size of the domestic units in San Ramón during this phase.

4.2.2 Pavas Phase (300 B.C.- 300 A.D.)

During the Pavas phase the regional picture is quite different (Figure 4.3). There is an obvious increase in the amount of occupation in the region, and there is also a preference for locating settlements in the flattest lands, towards the east of the region. Most of the people who settled in the steeper locations set their houses at the bottom of hills, right next to the rivers. As noted in the previous chapter, the number of actual people who lived in the region also increased

substantially during this phase—although not as notably as the increase in dwellings—going from only 1 person (averaged out across time) to between 129 and 259 people. Thus the striking increase in the number of occupation locations observed in the map does not necessarily represent such a dramatic increase of population, at least in this case. In Figures 4.4 and 4.5 it is possible to see that the unsmoothed (power 4) occupational surface for the Pavas phase shows a number of tiny peaks quite spread through the region, mainly at the northeast. Four tall peaks are clear on the surface, two at the north, one near to the center and one—the tallest—at the south. Because of the wide distribution of the peaks, and their tiny size, it is reasonable to guess that most of them represent single families spread out on the landscape instead of larger social entities (hamlets, villages). However, it is possible to go beyond guessing by estimating the number of people within each cluster delimited on the unsmoothed surface and contour maps (Figure 4.6). The two tallest peaks do indeed seem to represent family aggregations—one was a small village inhabited by 34 to 68 people, while the other was a hamlet where 27 to 54 people lived close together. The rest of the region was inhabited by a total of 68 to 137 people who lived in single dwellings spread out across the landscape.

Larger-scale social structures were also explored for the Pavas phase by looking at the more smoothed surfaces and contour maps produced by powers less than 4 (Figures 4.4 and 4.5). Power 2 is not strong enough smoothing to produce much difference in the surface. At a power of 1, a small basal projection begins to appear around the occupational peaks, and these broaden at powers of 0.5 and 0.25. At a power of 0.5, large clusters appear, one corresponding to the peak at the southern edge of the region and the other the peak located near to the center, which encompasses most of the settlements at the center and northeast of San Ramón.

One clear valley of occupational density separates these two clusters, suggesting that the inhabitants living in each of these two clusters interact more intensively among themselves than with inhabitants of the other cluster. Also, at the northwest of San Ramón, there is one smaller peak which appears separated from the surface emerging east to it. However the territorial size this cluster consists of is too small to be considered a large-scale community (Peterson and Drennan 2005: 12-13). Even though powers 0.5 and 0.25 both outline quite clearly two apparently large occupational clusters, the power 0.25 surface was discarded because it distorts the regional image by elevating too much the surface of the entire region. Thus, the power 0.5 smoothed surface was chosen in this case to delimit these regional entities (Figure 4.7). Looking at the number of people each of these two clusters contains indicates that only one of them—the one located near to the center of the region—is actually a very large community. It encompassed between 80 and 160 persons.

The wide distribution of single dwellings across the region, and the fact that only one small village and one hamlet emerged during the Pavas phase points to a political panorama where leadership was not much exercised beyond the household. Also the observed evidence indicates that the economy of the region was centered on the domestic needs of each family. Thus, both political and economic decisions were probably independently by each individual household, and little leadership exited beyond the family.

4.2.3 Curridabat Phase (300-900 A.D.)

Things changed once again in the Curridabat phase; and it seems they changed in the same direction they changed from Barba to Pavas, but much more strongly. As defined in Chapter 3, both the number and size of settlements in the region increased during this phase, as well as the number of people living in it. Looking now at changes within the region it is possible to see that the major increase in population occurred at the northeast (Figure 4.8), especially towards the center of the region where the terrain is most even, and where the largest concentration of people was located in the previous phase. Some large settlements also emerged towards the middle-west of the region. Interestingly, in contrast to the settlements located at the east, these settlements are located on broken topography. However, in general, the location of settlements did not change much from Pavas; instead most of the settlements founded during Pavas increased in size and population during Curridabat. Just a few settlements built during Pavas were abandoned, and frequently another settlement appeared during Curridabat located near the one abandoned. With the exception of the southeast of the region which was notably more populated during Curridabat, inhabitants from this phase did not venture into other sectors of the region, beyond the ones already occupied in the previous phase.

Surface and contour maps are especially helpful in this case for clarifying some specifics of what actually happened in the transition between these two phases. Although the map of settlement distribution (Figure 4.8) tells us that the amount of single dwellings increased during Curridabat, the unsmoothed surfaces and contour maps (Figures 4.9 and 4.10) show that the amount of people in each rural or domestic unit decreased. They also tell us that some larger

clusters of people emerged during this phase, mainly near the center of the region. Looking at the estimated number of people for each of these clusters, it is clear that they represent eight villages (Table 4.1) and one hamlet (Figure 4.11). Thus, although the number of hamlets was stable from Pavas to Curridabat—just one in the entire region—the number of villages went from one to eight. The number of people living in villages also increased strikingly during Curridabat; while only 34 to 68 people lived in these local communities during Pavas, between 1210 and 2421 people did during the next phase. Although the population living in scattered dwellings during Curridabat was practically the same as during Pavas—decreasing only from 68 to 137 individuals to 56 to 112, the change in the proportion of people living in "the countryside" in relation to people living in much more nucleated communities is quite substantial during Curridabat. While "rural" or dispersed population represented about half of the regional population during the Pavas phase (52%), it composed only around 6% of people living in the region during Curridabat (see Figures 4.5 and 4.10).

Looking again at the surface and contour maps, it is possible to notice that the smoothed surfaces, especially the ones produced with powers of 0.5 and 0.25 (Figure 4.10), make evident two separate regional clusters. Clearly these two entities are the same ones that had been detected in the previous phase, and once again one of them can be taken as a community of a truly regional nature while the other is just one of the villages identified above. During Pavas the community at the south of the region was a hamlet inhabited by 27 to 54 people; during Curridabat times it became a large village hosting between 324 and 649 people. The large cluster emerging at the center of the region is more clearly defined during Curridabat (Figure 4.12); this is because now it contains more people more evenly distributed throughout

the territory it encloses. This district had a population of 876 to 1752 persons, encompassing within its territory six of the eight villages located in the entire region at this time.

To sum up, during the Curridabat phase there was a remarkable increase in the total number of people which was represented just mildly in the increase of number of occupation locales. Village life also started in earnest during this phase, which indicates that daily interaction had became so relevant for the people that they chose to live in close proximity; more than 90% of the people lived in these nucleated local communities. Turning to the political sphere, it is relevant to ask how autonomous these villages were. The regional integration of the region during this phase was explored by using rank-size graphs (see Chapter 2). The resulting graph (Figure 4.13) show a convex settlement pattern whose *A* value (Drennan and Peterson 2004) is .315, which indicates that the regional integration was low during this phase. This result is not surprising looking at the differences in population size for each village across the region represented in the surface maps. No village seems to have attracted substantially more population than the others. However a district was detected at the center of the region, where the large villages located at the center of the region seemed to integrate a large proportion of the people living nearby. Although we still do not know the functional character of this district, the evidence supports a regional political landscape in which largely autonomous interacting villages emerged in San Ramón region encompassing most of the population in the region.

4.2.4 Cartago Phase (900-1550 A.D.)

During the Cartago phase, the general regional settlement pattern (Figure 4.14) did not change substantially from the previous phase. There was a slight abandonment of the flattest lands located at the east, near the center of the region; there was also an increase in the amount of occupation located adjacent to rivers, mainly at the north of the region. There was also a slight decrease of population at the south of the region; for example, the settlement located at the southern frontier of the region that became a large village during the previous phase, now became smaller in size. Just one settlement in the region grew substantially during this phase. This site located at the west of the region near the center, became much bigger; this happened while another settlement, located just west of it, became much smaller. Looking now at the unsmoothed contour and surface maps (Figures 4.15 and 4.16), it is evident that the peak at the southern extreme of the region in the previous two phases now became almost imperceptible. At the center of the region, the four peaks of the previous phase became just two during Cartago. Three peaks appear now at the northwest section of the region, while two other peaks that had emerged during the previous phase towards the east of the region, are still there. Taking into account the numbers of people these peaks represent (Table 4.2) it is clear that all of them were large enough to call local communities. The two smallest communities can be described as large hamlets or small villages. The largest community during Cartago was a very large village which hosted at least 373 people and possibly up to 746. This village had been nothing more than a hamlet during Pavas, and during Curridabat it became much larger. The large village located south of the one just mentioned, lost a small part of its population;

meanwhile the other village located northwest the largest village during Cartago practically disappeared. Between 864 and 1729 people had lived in local communities (Figure 4.17) during the Cartago phase, while only between 123 and 245 individuals lived in dispersed dwellings. Thus, although the number of people living in the countryside doubled from the previous phase, it continued to be just a small proportion of the regional population, representing only about 12% of it.

The disappearance during this phase of the large village located at the south of the region helped, to a great extent, in the integration of the region. Basically, the district located at the center of the region during the previous two phases finally seems to have integrated within its territory the entire region during Cartago. This situation is clear in the smoothed contour and surface maps (Figures 4.15 and 4.18), where the lines do not divide sections in the region but instead encompass the entire territory. The single village, located on the center of the studied area, attracted towards its vicinity most of the population living in the region. Given the fact that at this point of the pre-Columbian sequence in San Ramón there were no other villages even nearly as large as the central one, the population centralization around it occurred without any competition. The largest villages in the region were located in the vicinity of the large center, and only very few people lived far away from it, in small and spread out houses. Thus, both the distribution of people among villages and hamlets, and the distribution of villages, hamlets and houses throughout the region support the view that people living in the region were integrated by this large center. This conclusion receives further support from the rank-size graph for the phase (Figure 4.19), whose A value (-.209) suggests a more strongly integrated system than the one of the previous phase. Thus, the evidence supports a regional

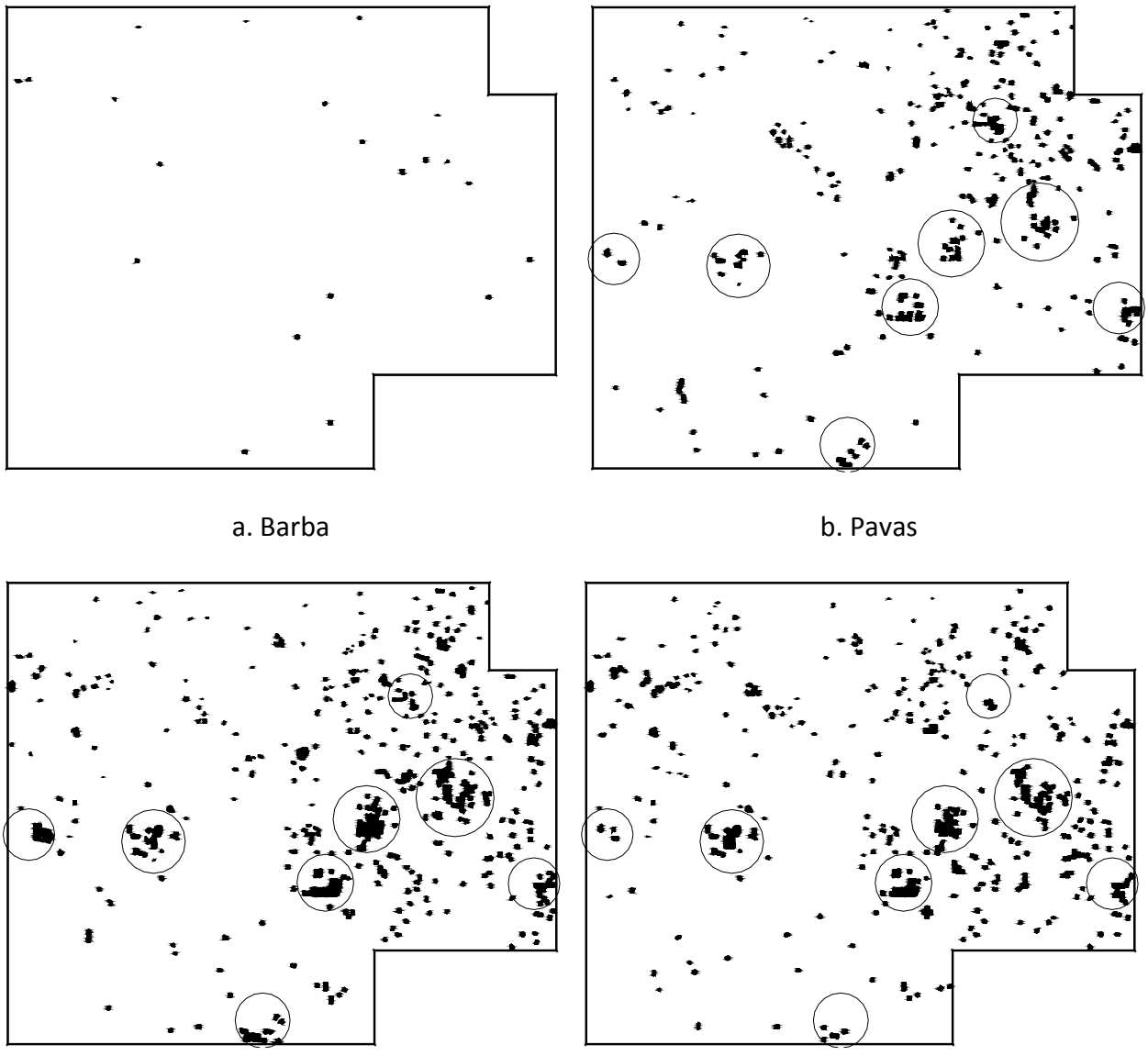
scenario where, during Cartago, one single very large village grew near the center of the region and integrated under its influence practically all the other occupation of the San Ramón survey region. Referring to Figure 4.20, we can have a fair degree of confidence in this change, although perhaps not as much as we might like.

Table 4.1. Number of people living in local communities (hamlets or villages) during the Curridabat phase, in the San Ramón region

Minimum	Maximum
324	649
311	622
204	408
112	223
98	196
62	123
60	119
40	79
19	37

Table 4.2. Number of people living in local communities (hamlets or villages) during the Cartago phase, in the San Ramón region

Minimum	Maximum
373	746
157	314
95	191
69	139
63	126
41	81
36	73
30	59



a. Barba

b. Pavas

c. Curridabat

d. Cartago

Figure 4.1. Maps of settlement distribution. Circles on the map enclose some areas where, despite the general dispersed regional settlement pattern, settlement clusters appear in certain phases

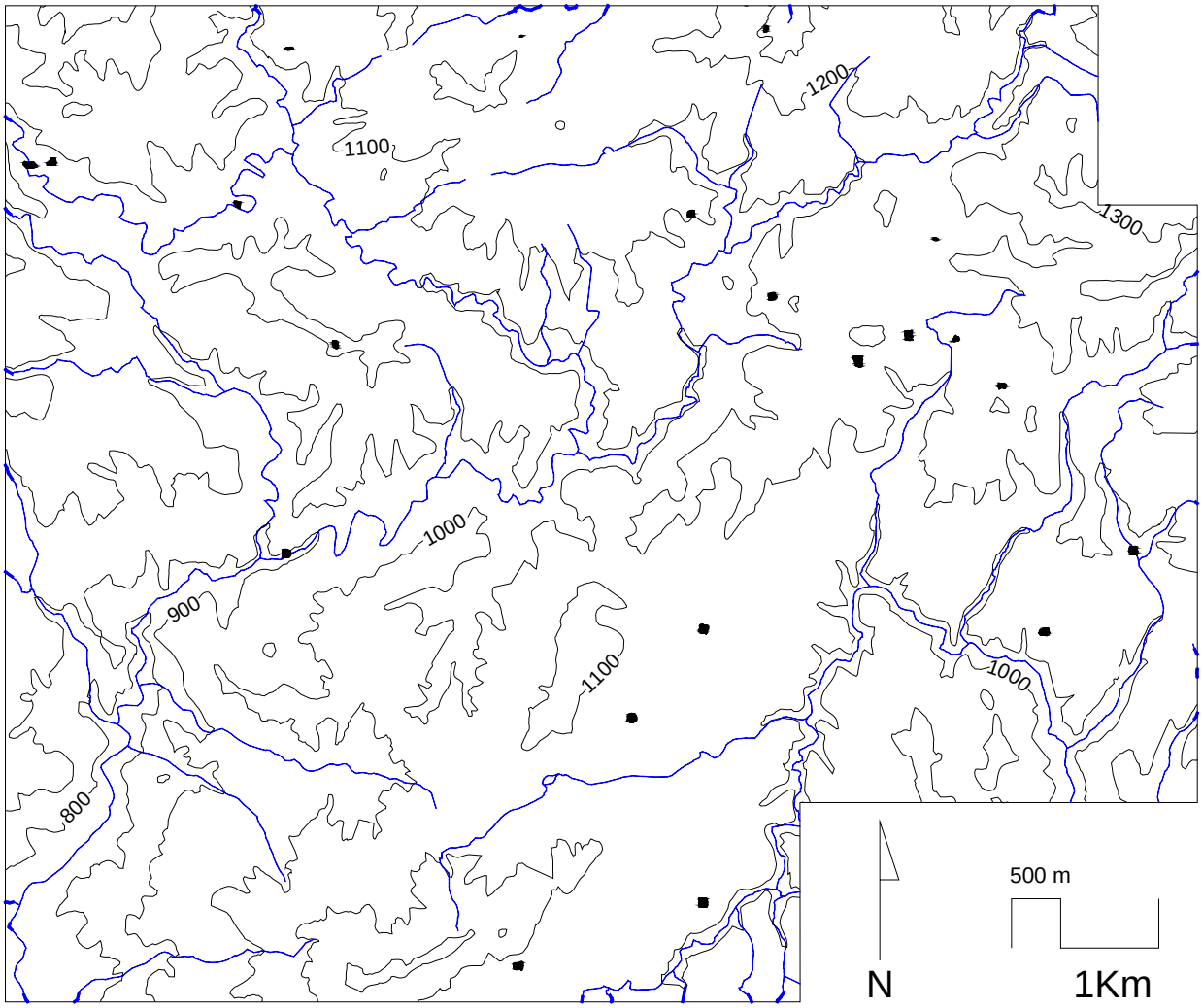


Figure 4.2. Settlement pattern distribution during the Barba phase

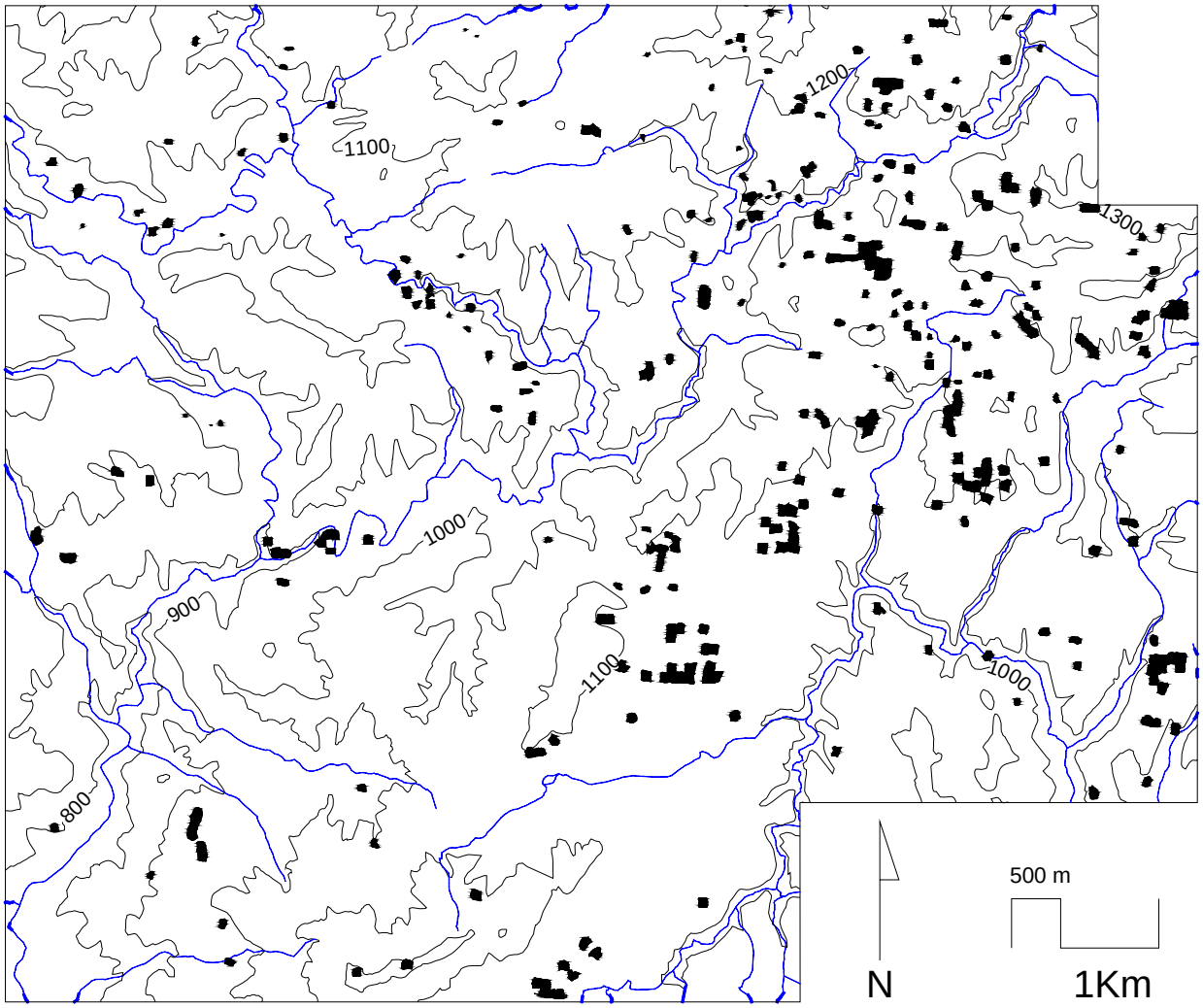


Figure 4.3. Settlement pattern distribution during the Pavas phase

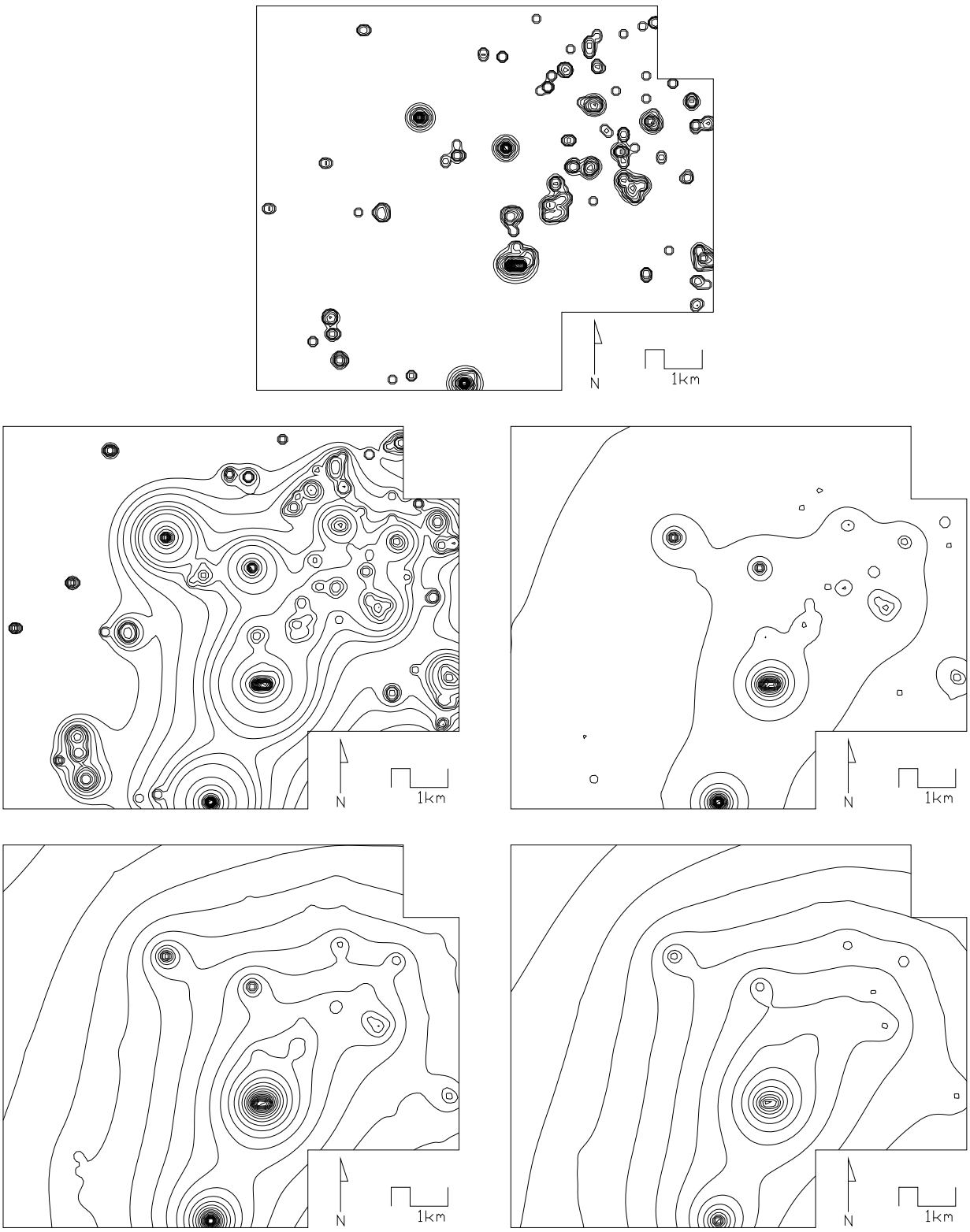


Figure 4.4. Contour surfaces representing the population during the Pavas phase. Smoothing increases from top to bottom, with inverse distance powers of 4, 2, 1, .5, and .25, respectively

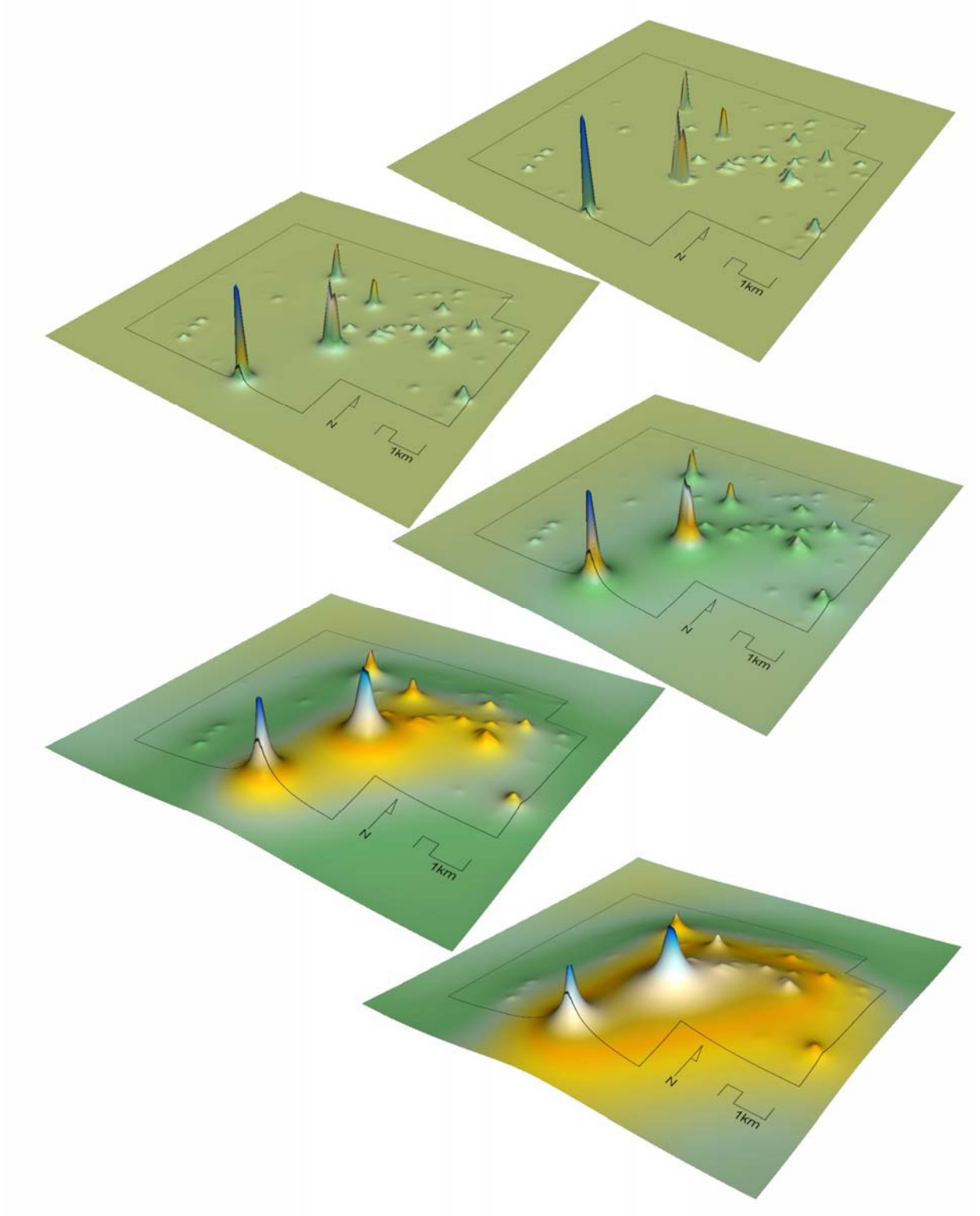


Figure 4.5. Surfaces representing the Pavas phase occupation. Smoothing increases from top to bottom, with inverse distance powers of 4, 2, 1, .5, and .25, respectively

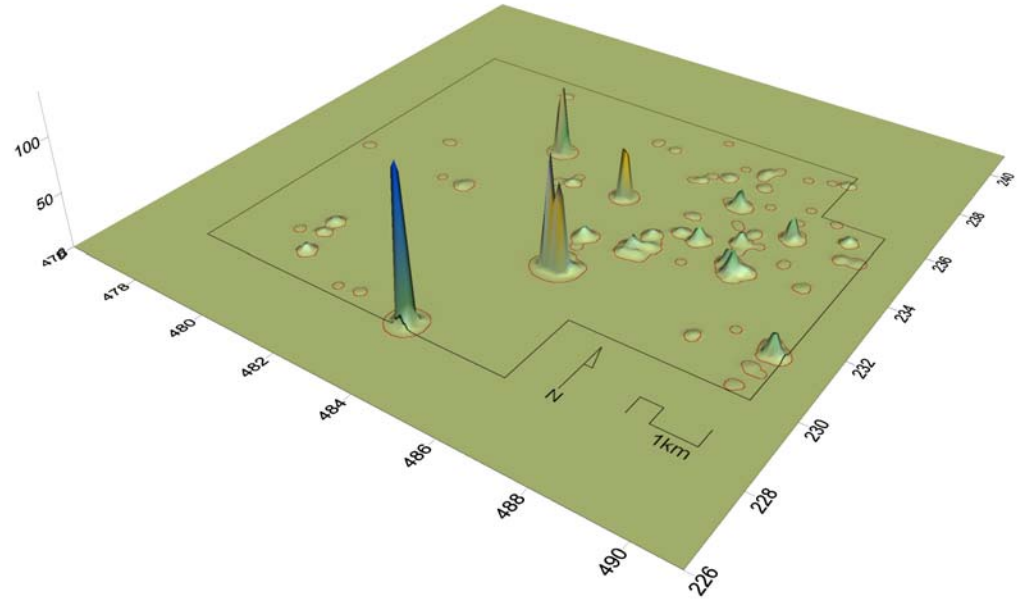


Figure 4.6. Defining potential hamlets and villages for the Pavas phase

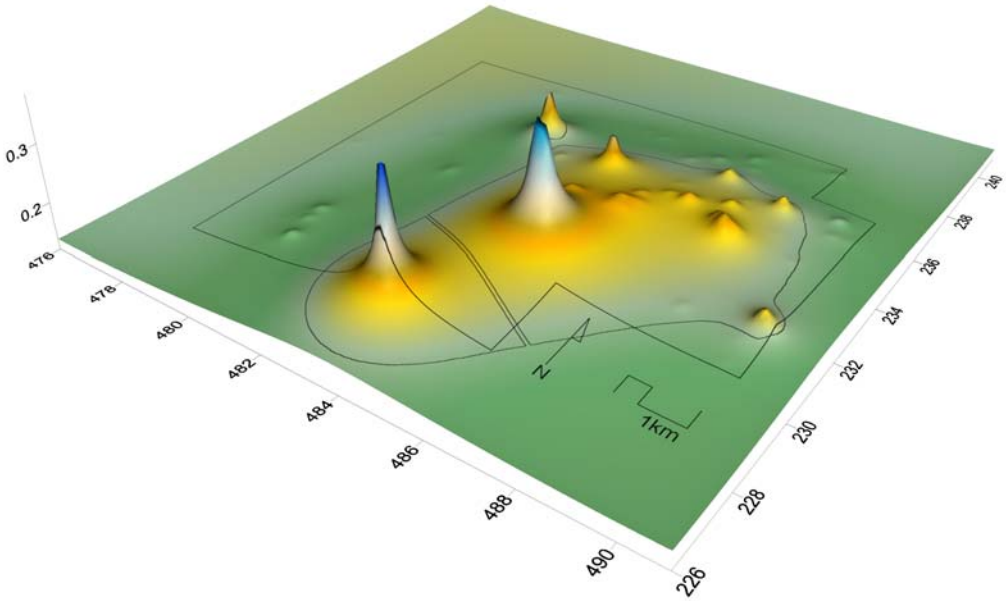


Figure 4.7. Defining potential districts for the Pavas phase

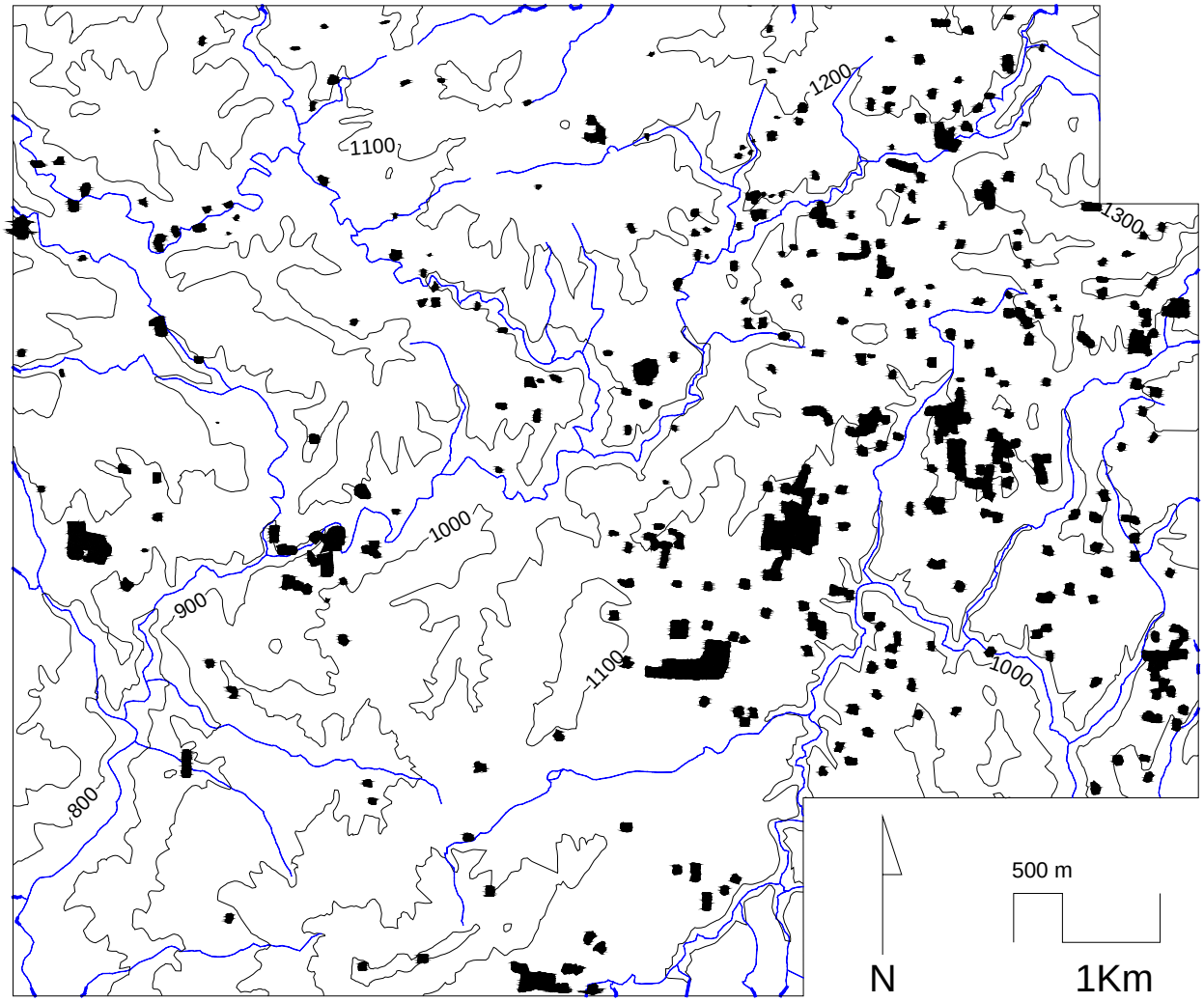


Figure 4.8. Settlement pattern distribution during the Curridabat phase

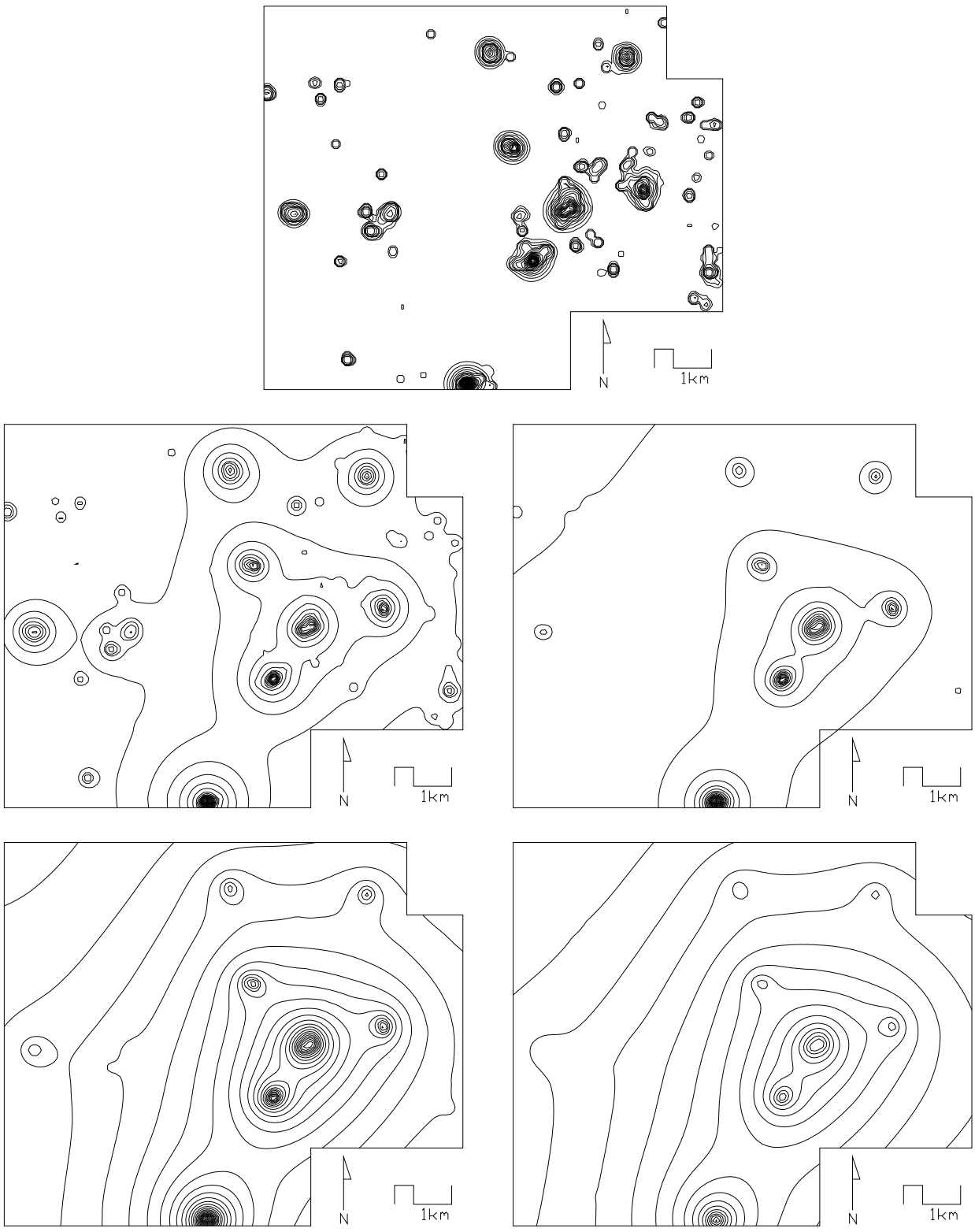


Figure 4.9. Contour surfaces representing the population during the Curridabat phase. Smoothing increases from top to bottom, with inverse distance powers of 4, 2, 1, .5, and .25, respectively

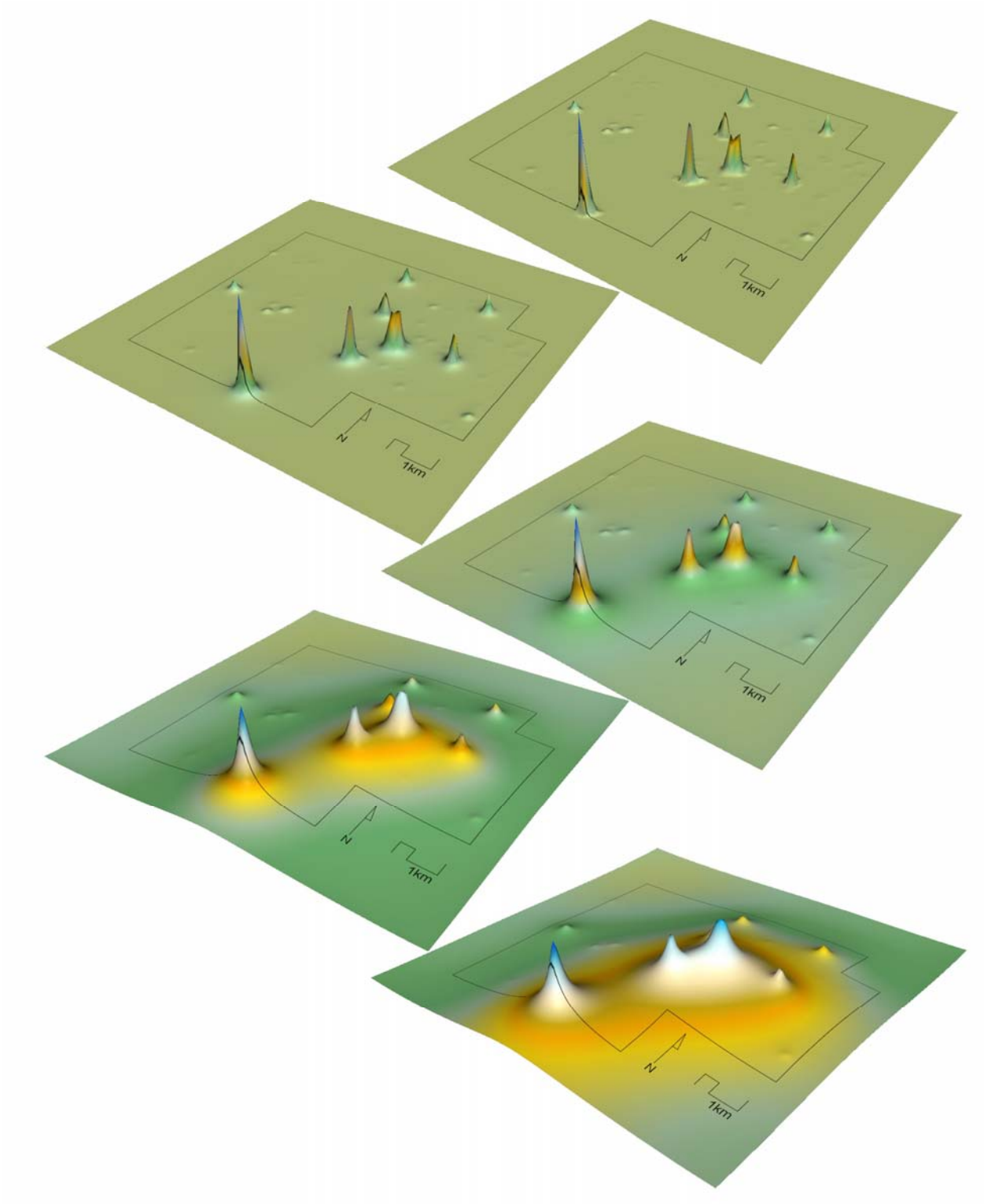


Figure 4.10. Surfaces representing the Curridabat phase occupation. Smoothing increases from top to bottom, with inverse distance powers of 4, 2, 1, .5, and .25, respectively

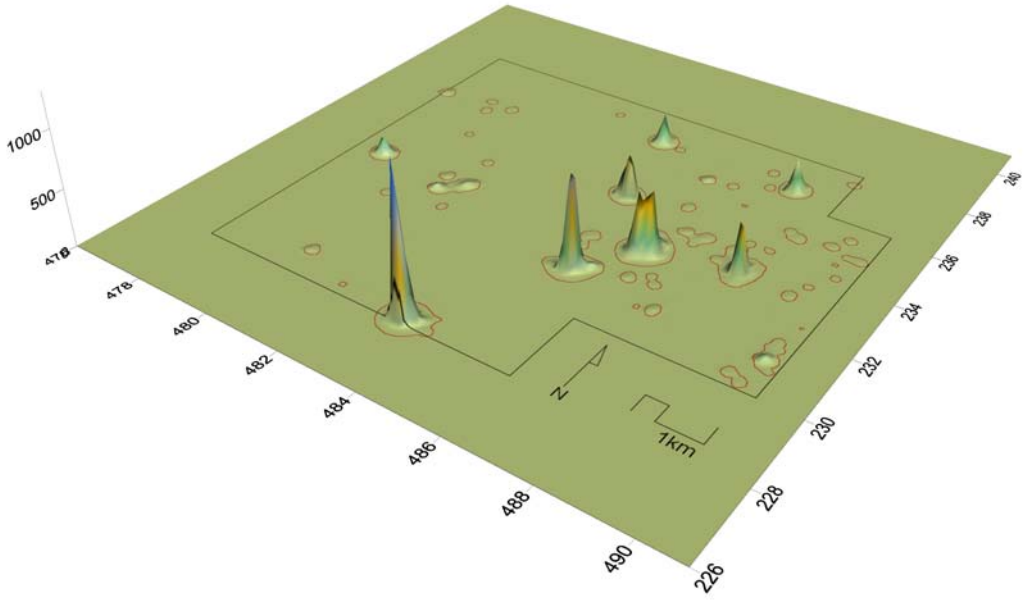


Figure 4.11. Defining potential hamlets and villages for the Curridabat phase

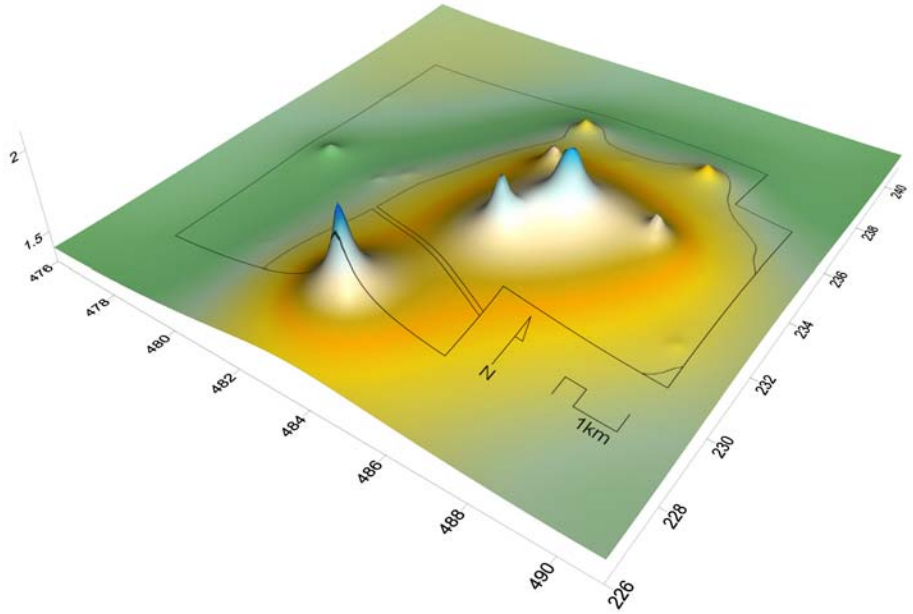


Figure 4.12. Defining potential districts for the Curridabat phase

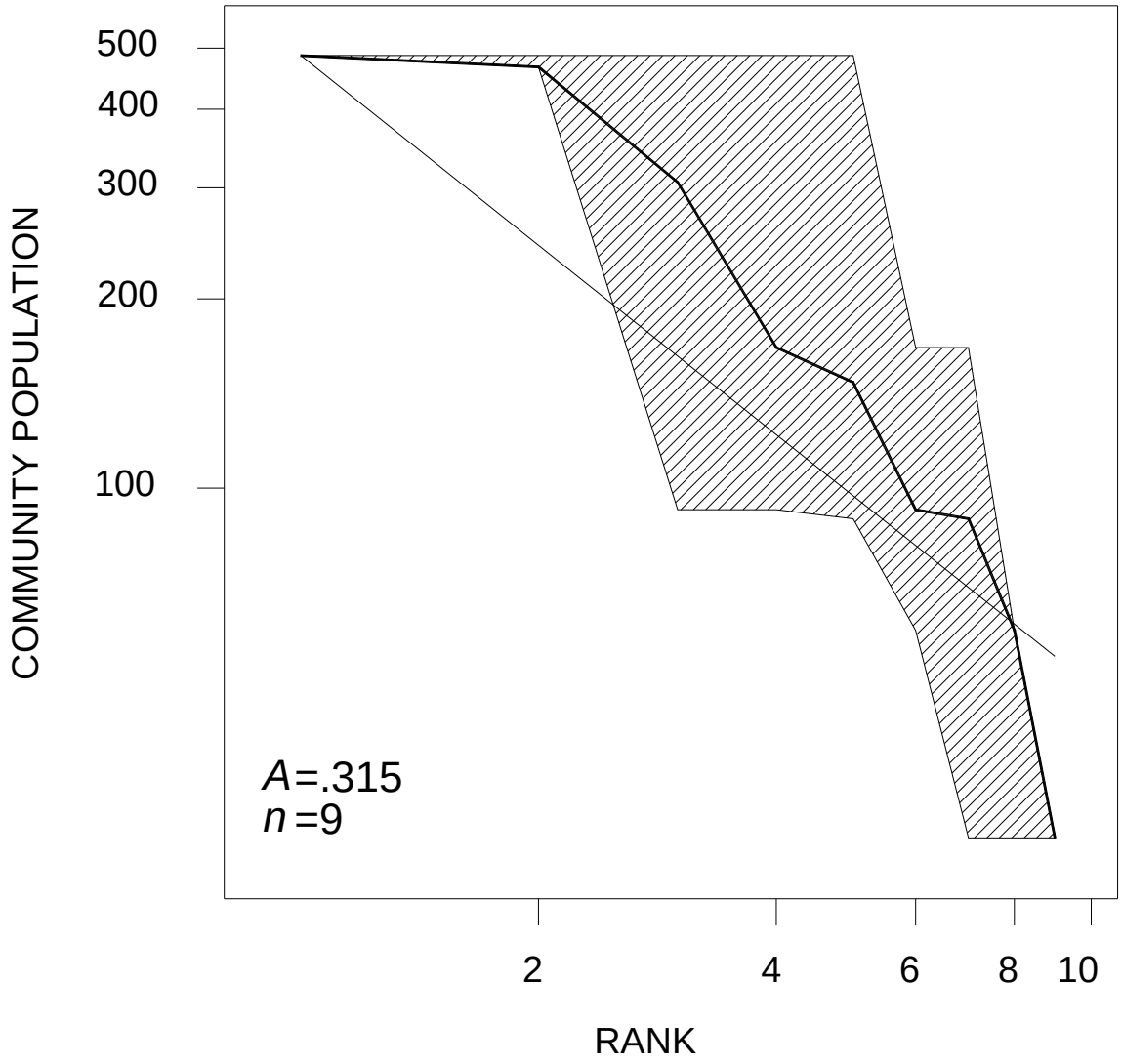


Figure 4.13. Rank-size graph for local communities in the San Ramón region during the Curridabat phase (with a 90% confidence zone)

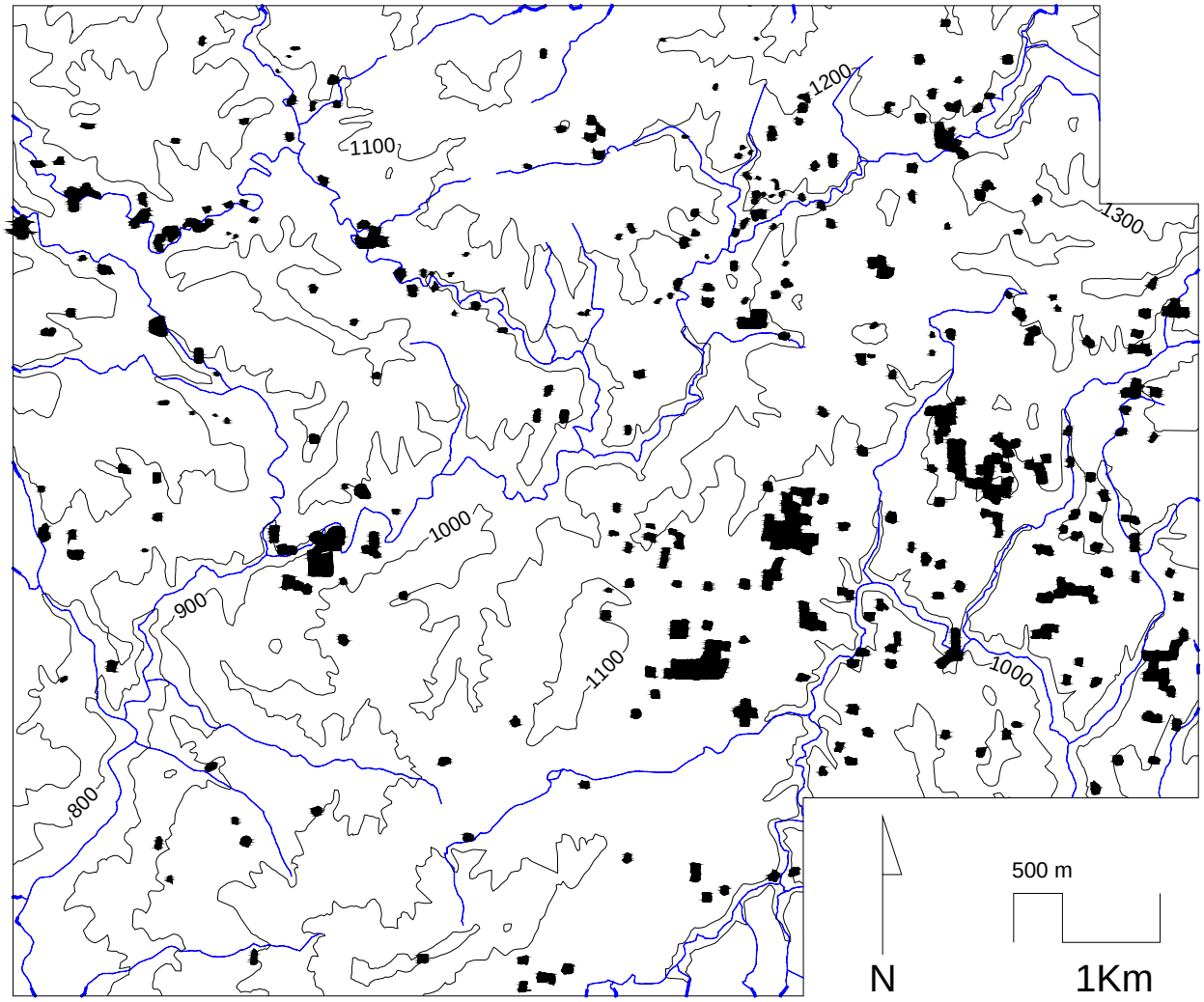


Figure 4.14. Settlement pattern distribution during the Cartago phase

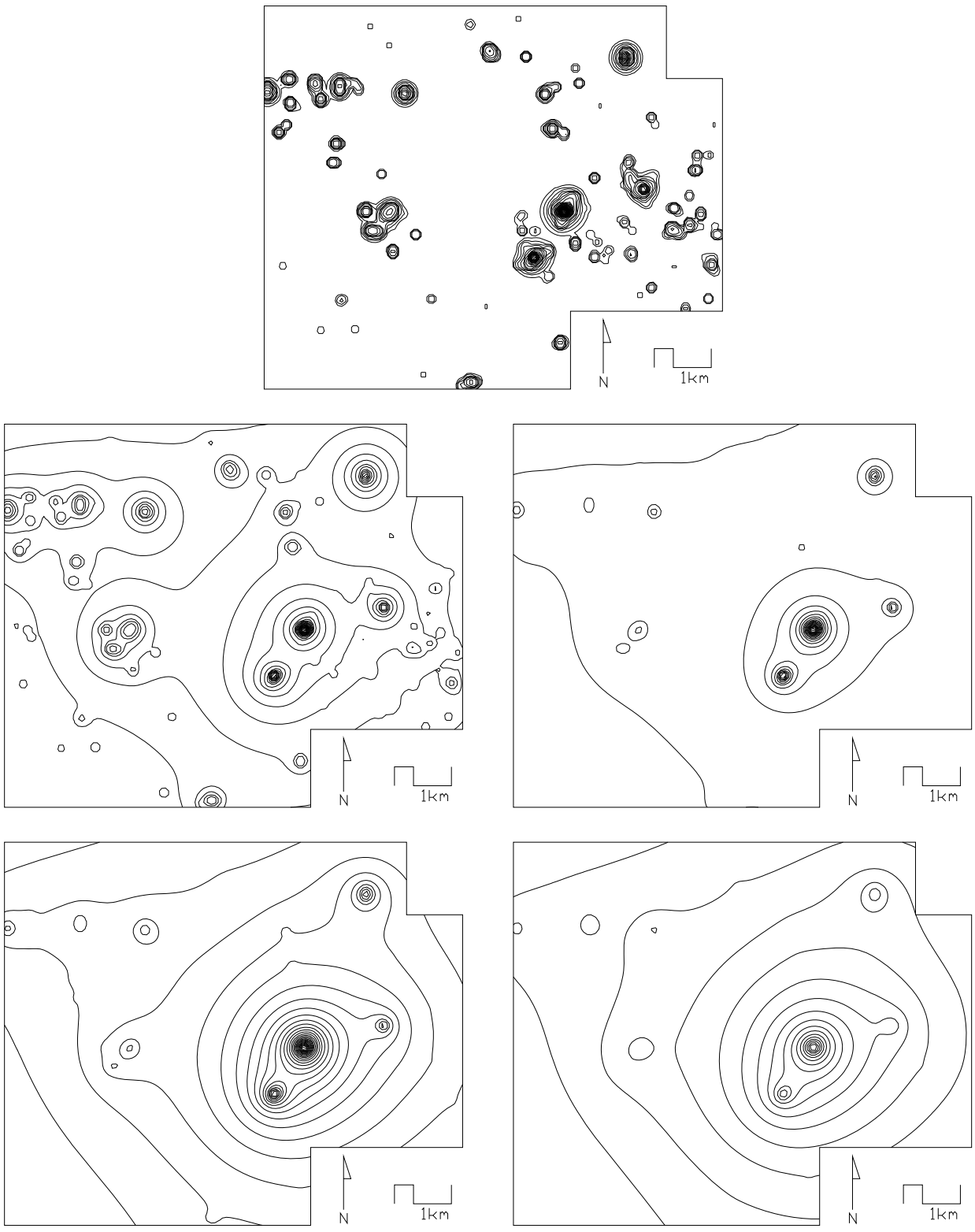


Figure 4.15. Contour surfaces representing the population during the Cartago phase. Smoothing increases from top to bottom, with inverse distance powers of 4, 2, 1, .5, and .25, respectively

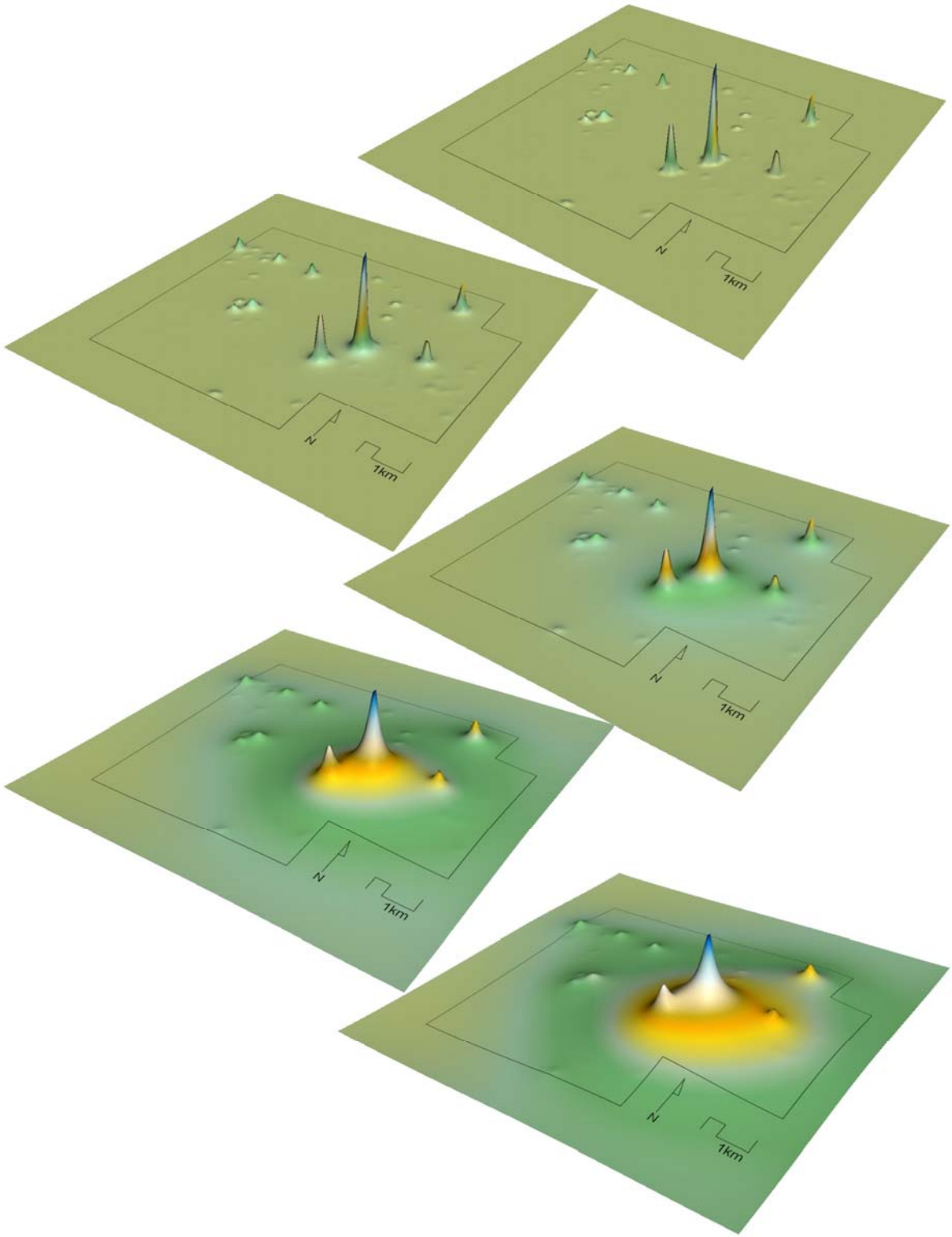


Figure 4.16. Surfaces representing the Cartago phase occupation. Smoothing increases from top to bottom, with inverse distance powers of 4, 2, 1, .5, and .25, respectively

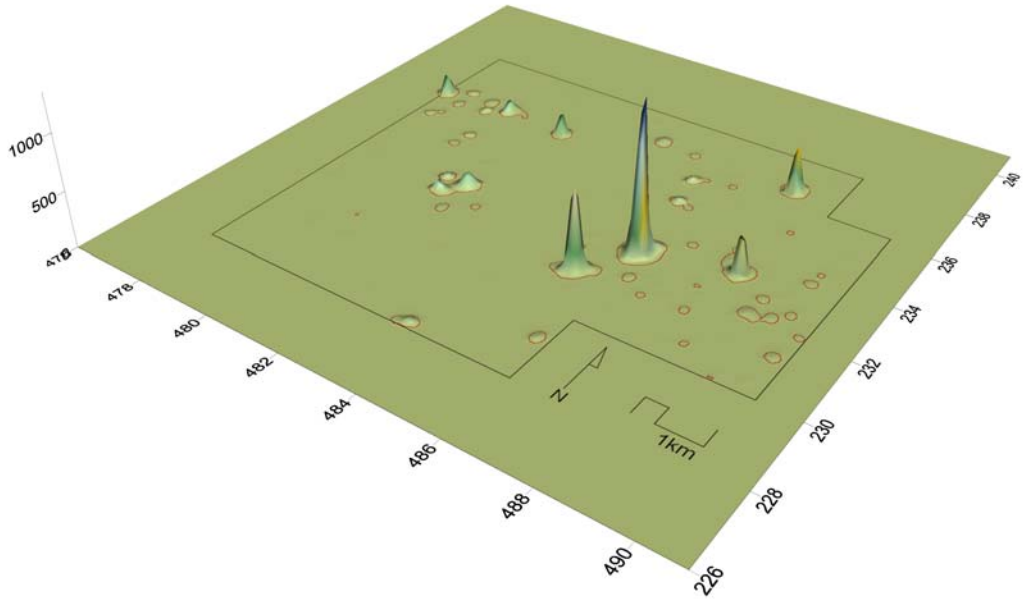


Figure 4.17. Defining potential hamlets and villages for the Cartago phase

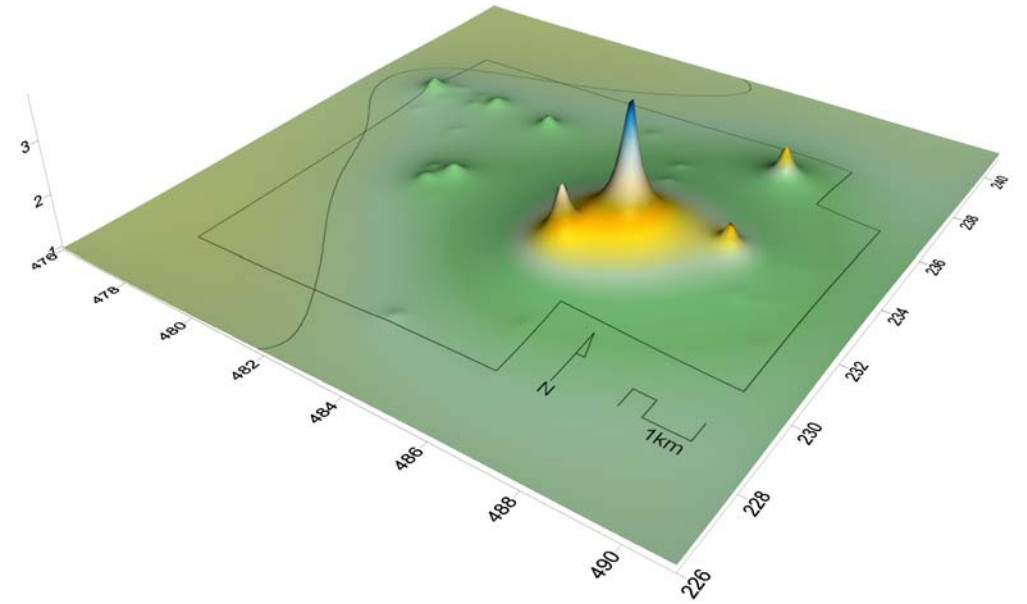


Figure 4.18. Smoothed surface map showing the integration of the entire San Ramón region during the Cartago phase

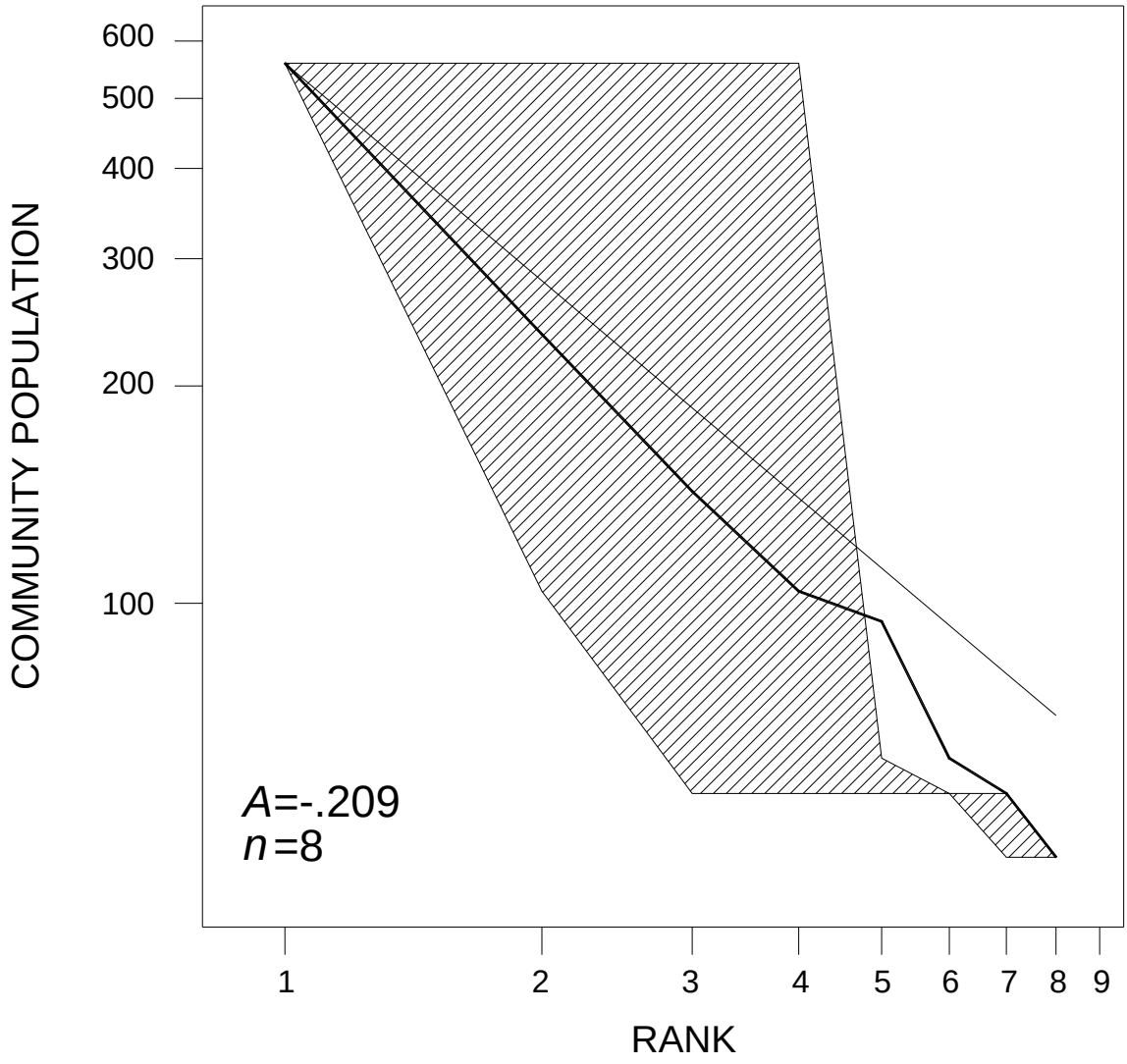


Figure 4.19. Rank-size graph for local communities in the San Ramón region during the Cartago phase (with 90% confidence zone)

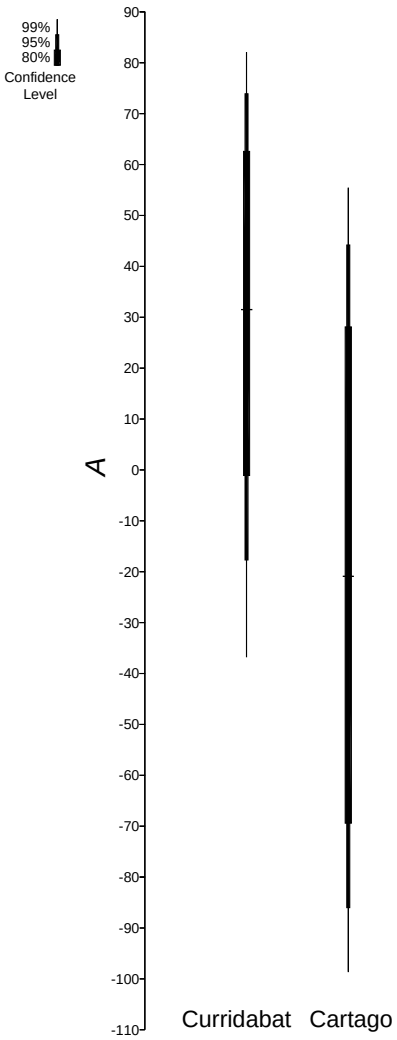


Figure 4.20. *A* values for Curridabat and Cartago phase regional political integration compared

5.0 CHARACTERIZATION AND COMPARISON OF PRE-COLUMBIAN SOCIOPOLITICAL TRAJECTORIES FROM NEIGHBORING REGIONS

Having already reconstructed the pre-Columbian sociopolitical trajectory of San Ramón region, in this chapter we will compare it to the trajectories of social change from neighboring regions. The trajectories of the Central Highlands, the Central Pacific, the Arenal, and the Central Guanacaste (Cañas-Liberia and Tempisque regions) regions (Figure 1.2) have been reconstructed by putting together the accounts of social change offered by archaeologists who have worked in those regions.

The comparison of trajectories of social change of neighboring regions makes it possible to assess how differently (or how similarly) these human groups were organized socially and politically, how this organization changed through time, and whether changes occurred synchronically among regions or not. This is precisely the kind of information required to evaluate the models of social change introduced in Chapter 1, because each of the models gives a different weight to the role that interregional relationships played in pre-Columbian social change. Thus, by contrasting these models against empirical evidence it is possible to advance our understanding of the nature of ancient social change in this part of the world.

The amount and type of data available for reconstructing the sociopolitical trajectories vary from region to region, as well as from period to period in each region. I tried as much as

possible to rely on accounts for the regions adjacent to San Ramón region that were based on archaeological data specific to those regions (Arenal, Central Guanacaste, Central Highlands, Central Pacific). Sometimes, however, in order to fill in gaps in local trajectories it was necessary to make use of accounts for larger cultural units (e.g. Guanacaste or the Central Region) (Figure 1.1). In any case, the comparisons are as regionally specific as possible, as indicated by the names of the regions actually compared that are used in the text.

As the data for talking about sociopolitical events in regions of thousands square kilometers such as the Central Highlands, Central Pacific, Arenal, and Central Guanacaste comes from a number of partially excavated sites and small surveys, the systematic survey carried on in San Ramón de Alajuela provided us with a window of 110 km² for looking at the pre-Columbian events that happened in the most western side of the Central Highlands, or as it has been called it here: the San Ramón Region.

As noted in Chapter 1, the existence of interregional exchange in pre-Columbian times in the territory today known as Costa Rica (including all the regions compared here) has been widely demonstrated (e.g. Fonseca and Richardson 1978; Lange 1984b; Snarskis 1984b, 2003; Snarskis and Ibarra 1985; Stone 1977, 1986), and this research was not intended to evaluate whether it was present or not. Nevertheless, the *intensity* of interregional relationships is an aspect of the trajectories that is of great relevance for the evaluation of models of social change. Thus, changes in the volume of interregional exchange were included in the reconstructions of the trajectories of each region. By looking at the accounts of the presence of "foreign" materials in each region and for each period it is possible to track relative changes in the intensity of interregional relationships. Of all the objects involved in the transactions among

the regions compared here, only ceramics, jadeite, and a handful of slate-back mirrors are preserved in the archaeological record. Because three of the regions largely share the same ceramic features (the Central Highlands, the Central Pacific, and San Ramón) only when pottery coming from Guanacaste is present can "foreign" pottery be recognized there. People in the Arenal region mostly used ceramic types common to Greater Nicoya (Figure 1.1); nevertheless Hoopes (1994) managed to identify some types imported from Guanacaste, as well as pottery from the entire Central region (Central Pacific, Central Highlands, and Caribbean Watershed). Thus, it was possible to track variations in exchange for the Arenal region with the Guanacaste, Central Guanacaste and Central regions. General accounts (Corrales and Quintanilla 1992; Lange 1984b; Snarskis 1981a, 1984a, 1984b, 1992) about changes in the frequency and direction of inter-regional contacts for the Central Highlands and Central Pacific regions made it possible to reconstruct their exchange with the Guanacaste and Diquís regions.

5.1 COMPARING NEIGHBORING TRAJECTORIES OF SOCIAL CHANGE

5.1.1 Period 1000-300 B.C.

Information from this period comes from a handful of sites spread out through the entire Costa Rican territory. The demographic reconstruction of the San Ramón region during this period concluded that just a few families lived spread out through the region. The insignificant amount of garbage left by these families certainly reflects the small size of households, but may also imply a mobile or semi-mobile settlement pattern. In the case of a mobile pattern, non-

ecological circumstances must have been involved. Even if these groups had employed a slash-and-burn cultivation system they would not have had to move, for two reasons: First, as Carneiro (1960, 1961) has demonstrated, tropical soils can support completely sedentary human groups of up to 500 people even if they practice slash-and-burn agriculture. And, second, the figure of 500 was calculated using a "low average" for horticultural conditions in the Amazon Basin. Thus if we take into consideration the high resilience and suitability for intensive agriculture of San Ramón soils (Chapter 2), its real carrying capacity for slash-and-burn agriculture is quite probably well over 500 people. In addition, population density was so low during this period that local fishing and fauna (Chapter 2) could have easily supplied the protein demand.

In the Central Highlands region, even though no funerary or settlement pattern data have been described up to now for this period (Snarskis 1982: 84), it has been suggested that "population growth was slow, and density was relatively low" (Snarskis 1992: 143), while "settlements were apparently very few, small, and far apart" (Snarskis 1978: 291). Subsistence economy was based on the procurement of staples for a mixed diet of roots, tree crops (Snarskis 1981a: 40-42, 1982: 84-94, 1984a: 201-206) and grain (maize) (Arford and Horn 2004; Clement and Horn 2001; Horn and Kennedy 2001). Cultivation practices such as forest clearance and burning fields have also been detected in this region (Lane, Horn and Mora 2004). In contrast, in the Arenal region at least five houses dating between 2000 and 500 B.C. were found grouped into a hamlet (Bradley 1994; Hoopes 1987: 85-97; Bradley, Hoopes, and Sheets 1984; Sheets 1994: 318-321; Sheets et al. 1991: 458-459). In this region maize was integrated into the

diet of the inhabitants sometime between 2000 and 500 B.C. (Mahaney, Matthews and Blanco 1994; Matthews 1984).

In Guanacaste, between 1000 B.C. and 500 A.D. most of the territory was populated by small groups practicing a shifting residence pattern (Lange 1978: 108; 1984: 173). Approximately 45 km southwest of Arenal in Cañas Guanacaste (Figure 1.2), evidence of a more permanent settlement pattern has been detected (Odio 1992). Diet has been inferred to be based on mixed gathering and collecting, and on freshwater fishing (Lange 1992: 114); before 300 A.D. seafood seems not to have played a substantial role in the diet (Lange 1978: 107; 1984: 171; 173; 1992: 114).

In sum, the settlement pattern during this period seems to have been quite varied. Semi-mobile, small groups, mainly focused on inland resources seem to have lived northwest of San Ramón during this time while just east, in Arenal, the evidence points to sedentary people living in hamlets and producing maize. Contemporaneously, further east of San Ramón, people lived spread out, practicing some cultivation, or at least advanced gardening, during this period. Even though it is not possible yet to talk about the diet of the people living in San Ramón during this period, the available evidence supports a description close to the one given for the Central Highlands: very few, small houses, far apart. As already mentioned, a mobile pattern during this period cannot be discarded for San Ramón. Therefore semi-mobile, small families practicing "restricted wandering" as observed in Guanacaste before 300 A.D. is also a model to investigate in the future. All in all, the fact that in Arenal people lived in a more aggregated pattern during this period, and that in Cañas they invested in more permanent dwellings indicates a different

sort of social organization in these two regions, in comparison to San Ramón and the Central Highlands.

5.1.2 Period 300 B.C.-300 A.D.

As detailed in Chapter 4, there was a notable increase in population in San Ramón from 1 person in Barba to approximately 129-259 persons in Pavas. However it is clear that the population density was extremely low (around 1.8 persons/km²). Half of the population lived in single domestic units spread out the region while the other half lived aggregated in a hamlet located at the south of the region and in a small village located at the center of the region. People living in the village had a regular interaction with families inhabiting the nearby dispersed houses, and vice versa. The formation of a small community during this period indicates that the regional social structure changed. A mixed pattern emerged where several dozens of families living in dispersed houses coexisted with families living grouped in a small village. Thus, social relationships in San Ramón were created and maintained mainly in three different ways: between individual households, in the relation of individual households and a neighboring village, and between the families composing the village. A much lower intensity of social relationships can be expected between dispersed houses. The demographic structure of the region during the Pavas phase indicates a political panorama where leadership was mostly located at the household level, where the social relationships of the region were mostly centered. Interregional exchange in San Ramón began during this period; however it seems to

have been minimal. Ceramics from Guanacaste represented less than 0.07% of the total ceramics in the region during this period.

Meanwhile, the Central Highlands region was undergoing a dramatic increase in number and size of settlements, and therefore of population (Fonseca 1992: 134; Snarskis 1981a: 42, 1984a: 216; 1992: 144). This sharp increase in settlements seems to have begun around 300-200 B.C., culminating in numerous but dispersed agricultural settlements in the first few centuries of the Christian era. Population growth has been described as rapid and extensive colonizing of new zones such as alluvial plains and fertile highland valleys is apparent. Settlement pattern diversity has been noticed in the Central Highlands for this period; thus León and Salgado (2002: 11-12) have described a range that goes from isolated dwellings to nucleated villages and from semi-mobile groups to completely sedentary population. During this period an elite-oriented exchange in the region began in the Central Highlands with Guanacaste—which was already involved in an indirect exchange network with Mesoamerican cultures—but was still very limited (Snarskis and Ibarra 1985: 59). This pushed the Central Highlands towards rank stratification during this period, an event consolidated during the next period (León and Salgado 2002: 12; Snarskis 1981a: 44, 1984a: 216, 1986: 113, 2003).

In the Central Pacific region, the settlement pattern is described as “small and dispersed villages, frequently located along secondary rivers”, which “corresponds with the…distribution of settlements for the Central Archaeological Region” (Corrales 1996: 101). Corrales and Quintanilla (1996: 100-101) have argued that increasing social complexity is noticed during this period, and that “although an egalitarian type of organization still characterized the social system, some changes are observed in which the political power and the control of distribution

networks rely on the authority of the 'chief'." Trade with the Guanacaste region began during this period, though it was very limited (Corrales and Quintanilla 1992: 113).

The first centuries A.D. have been described as the time of maximum population density in the Arenal region. Domestic housing remained unchanged from the previous phase and the society was still egalitarian; households maintained approximately equal status and power. Villages were both larger and more numerous, but the basic adaptation and village and household autonomy were maintained. Although external relationships have been detected during this period—with both the Central Highlands and Guanacaste—their incidence has been described as very low and irrelevant in local sociopolitical development (Sheets 1992: 33, 1994: 315; Sheets et al. 1991: 454).

Human organization throughout Guanacaste seems to have been quite diverse and complex. People preferred to live inland rather than near the coast; and while in the northwest coast a relatively large and settled population has been inferred (Lange 1984a: 173; Snarskis 1981a: 25), people located inland—including the Central Guanacaste region—lived in small, dispersed, groups and practiced a mobile residence pattern, even inhabiting small caves (Baudez 1967: 210; Coe and Baudez 1961: 510-511; Lange 1971: 210-211). While some of these groups lived on "permanent, year-round settlements" located at the bottom and on the slopes of the valleys and near the courses of the rivers, others practiced a "restricted wandering," following a seasonal round depending of the kind of resources utilized (Lange 1972: 15; 1975: 97; 1978: 108; 1984: 173; 1992: 114; Lange and Murray 1972: 64; Lange and Scheidenhelm 1972: 244). In relation to subsistence strategies, hunting, gathering of wild fruits and nuts, and

agriculture were all practiced during this period (Baudez 1967: 210; Fonseca 1992: 123; Lange 1971: 218-222; Snarskis 1981a: 26).

In the Guanacaste region, at the beginning of the period the elite inhabiting the region initiated a trade network of exotic goods with their peers located in Mesoamerica and eastern Costa Rica (Lange 1984a: 176; Snarskis 1981a: 29). An increase in complexity and settlement size is believed to have been the immediate effect of the emergence of these networks; accompanied by the emergence of agricultural villages, and reflected on a stratified society described as "at least low-level chiefdoms" (Fonseca 1992: 123; Lange 1984a: 173; Snarskis 1981a: 25-26). However this last description seems to have applied only to regions in Guanacaste other than Cañas-Liberia and Tempisque regions, given the fact that Guerrero and Solís (1997: 121, my translation) have asserted that "groups settled in the Cañas-Liberia region do not seem to have had a social organization based on chiefdoms" and Baudez (1967: 210, my translation) describes the settlements in the Tempisque region during this period as "rare, and population was small. They gathered in small villages, but small groups sometimes occupied caves."

Between 300 B.C. and 300 A.D. the sociopolitical situation in the San Ramón region has more parallels to the Central Highlands and the Central Pacific region than to the Arenal and Central Guanacaste regions. Certainly all the regions experienced population growth during this period, but this increase seems to have been more pronounced in the Central Highlands and Central Pacific regions than in the rest of the regions, as it was in San Ramón. San Ramón's regional structure is a mixed pattern of small spread-out dwellings and hamlets or small villages, precisely the settlement pattern found in those two regions. In contrast, people

inhabiting the Central Guanacaste region were still not completely sedentary while in Arenal people were living in villages, not dispersed. Looking at trade, during this period all the regions became involved in some interregional exchange; and with the exception of Guanacaste—the region more actively involved in exchange networks—the volume of exchange seems to have been insignificant.

The only divergence between San Ramón and the Central region trajectories, found during this period, is on the issue of sociopolitical organization. While the emergence of rank societies has been described for both Guanacaste and the Central region, the evidence from San Ramón points towards a panorama closer to the one described for Arenal. Community size and settlement pattern indicates a society still organized around the domestic unit, where little hierarchy existed beyond the household. Not a single indicator of social rank has been found in San Ramón for this period.

5.1.3 Period 300-900 A.D.

Even though the general settlement pattern in San Ramón did not change during this period, the number of people in the region increased dramatically; as was shown in Chapter 3, population was now 10 times larger than during the last period. Additional villages emerged in the region absorbing most of the population; thus the proportion of people living dispersed diminished notably. But because of the increase in total regional population the number of people in dispersed rural residences did not change from the previous period. Thus, fully agricultural village life was consolidated during this period in San Ramón, as indicated by the

emergence of eight villages—six of them forming a district—and the substantial increase in population. Also, a part of the population decided to invest more time and energy in their residences. Some villages such as Barranca and Volio (Chávez 1994a: 30; Rojas 1995) had a more complex architecture (bahareque, and cobble-stone pathways and low walls surrounding large earth mounds) indicating that people preferred to spend more time in their villages, and that some communal work might have been involved. However, as evaluated in Chapter 4, little political integration is noticed in the region during this period; which implies that leadership was only local, within each village. In addition, people in the region did not increase their participation in interregional exchange; participation in those networks during this period continued to be quite low (the proportion of ceramics from Guanacaste is 0.05%).

In the Central Highlands, at the beginning of the period, settlements seem to have followed the pattern of the former period—dispersed villages of several houses, usually located on alluvial terraces, with no evidence of sharply demarcated boundaries or defenses (Snarskis 1981a: 55; 2003: 193). Around 500 A.D. there are several changes in the archaeology of the region. It seems that there were fewer settlements, but they are larger and nucleated (Snarskis 1986: 113). Semi-dispersed sedentary agricultural villages with somewhat labor-intensive, large houses and civil works (e.g. differential architecture, cobble-stone pathways and house foundations, adobe floors), and rank-differentiated burials appeared in the sociopolitical landscape of the region (Fonseca 1992: 153; Snarskis 1992: 150-151). Accessibility to good agricultural land seems now to have been more important, as maize agriculture became more important. Craft production involved artisans engaged in extensive labor-demanding production of fine items. Intergroup conflicts were apparently infrequent. Instead of warfare,

communal energies were invested in ceremonies (and sacrifices) (Snarskis 2003: 193-194). A rank-structure society has been described for this period in the Central Highlands (Fonseca 1992: 137, 144). The flourishing, elite-oriented trade network between Guanacaste and the Central Highlands initiated in the last period and consolidated during this period has been described as responsible for this sociopolitical trend. However, after maintaining close contact with Mesoamerican culture for several centuries, around 700-800 A.D. leaders in the Central Highlands shift their trade towards Panama and Colombia. Thus, trade with Guanacaste became marginal during the period 500-800 A.D., while elite-oriented gold objects from the south were brought in to fill the vacuum produced by the breaching of ties with Mesoamerican elite groups (Fonseca 1992: 151; Snarskis 1981a: 54-62, 1984b: 36-38; 2003: 194; Snarskis and Ibarra 1985).

Meanwhile, in the Central Pacific region, a marked social hierarchy developed with greater mechanisms of political control and distribution of surplus production; "agricultural chiefdom societies characterized the social organization of pre-Columbian groups along…[the region]" (Corrales and Quintanilla 1996: 102, 105). Some villages developed the more time-consuming type of architecture (earthen mounds and cobblestone structures) that have been observed in San Ramón and the Central Highlands of the region during the same occupational period. A trade network at the regional level has also been described during this period, which involved exchange of local resources coming from different ecosystems, within the region. However, during the late occupation of this period a trade network also began with Guanacaste (Corrales and Quintanilla 1996: 106).

The millennium prior to the Conquest saw a population decline in the Arenal region. Population per village did not drop, but the number of villages decreased. Between 500 and 1200 A.D. status differences were apparently only related to sex. There was little external trade, and this was taking place mainly with the Guanacaste region. Apparently during this period people inhabiting the region were ideologically integrated based on ritual practices. However, the political autonomy of each village seems to not to have been challenged, instead socioeconomic stability—following the trend of previous periods—characterized for this period (Sheets 1992: 32-34).

Data available for the Central Guanacaste region becomes much more abundant for this period, and the following one. While the regional population seems to have increased moderately, during this period the region did not host any large population center (Baudez 1967: 211; Guerrero and Solís 1997: 60). Instead, population inhabiting the region was semi-mobile, living in small, spread-out hamlets located near primary and secondary water sources (Guerrero and Solís 1997: 59). Daily life during this period has been described as of "great simplicity," and the economy seems to have relied on the same basis as the previous period (Baudez 1967: 211). While some archaeologists who have worked in the region supported a view that although hereditary social hierarchy emerged in the region during this period (Guerrero and Solís 1997: 100), political authority in the region was always rather limited and never regional (Guerrero and Solís 1997: 121). During this period the Central Guanacaste region was highly active in an interregional exchange network with neighbor regions (Guerrero and Solís 1997: 101-102).

Comparing the trajectories, it is possible to see plenty of variations in social dynamics. Looking at demography, during this period in the Central Guanacaste and San Ramón regions experienced a population increase, apparently more marked in the last region. In contrast the other three regions (Central Highlands, Central Pacific and Arenal) seem to have maintained their population size. There was no variation in population distribution in Arenal, people still lived in hamlets or small villages, just like people living in Central Guanacaste did during this period. Although in this last region people were apparently moving occasionally. Meanwhile in the Central Highlands and the Central Pacific regions people aggregated into communities, although not necessarily increasing in number of people. In contrast, population increase in San Ramón happened simultaneously with social aggregation into autonomous villages.

Looking now at interregional exchange and social complexity, there is evidence that supports the view that all the regions were engaged in interregional exchange networks during this period. However, as noticed above, the participation of each region in these networks varied considerably. While the elite in the Central Guanacaste, Central Highlands and Central Pacific regions were intensively engaged in exchange networks, the Arenal and San Ramón regions seem to have had very little participation in them. Archaeologists have argued that only the elite from the mentioned regions were involved in this trade network (Lange 1984b; Snarskis 1984b), but as noted above, the nature of this elite was diverse during this period. While complex societies at the chiefdom level emerged in the Central Highlands and the Central Pacific regions—two of the three periods more actively engaged in interregional exchange—little hierarchy has been described for the semi-mobile, small groups inhabiting the Central Guanacaste region—precisely one of the regions with more evidence of interregional exchange

activities. Meanwhile, the Arenal and San Ramón regions were inhabited by people living in autonomous villages, mostly relying on local resources.

5.1.4 Period 900-1500 A.D.

Population centralization in the San Ramón region—which had started in two different sections of the region (center and south) during the last period—continued only in the district that had emerged at the center of the region. This resulted in an increase in population size in the district—specially focused on one of its villages—and population loss in the rest of the villages in the region. This decrease was especially dramatic in the other "competing" large village located at the south of the region during the last period, now reduced to only a small hamlet. Now, the population of the region lived almost entirely in close proximity to the surviving large center. Consequently, the limits of the district greatly expanded during this period until they finally encompassed the entire region. Thus, former autonomous villages were now integrated into a single sociopolitical entity whose regional center was located near the center of the region. As noticed in Chapter 4, the rise of sociopolitical complexity in San Ramón was not linked to increase in population size; on the contrary, the number of people in the region decreased, although only modestly. Villages and hamlets became more compact: more people lived in them but their extent did not increase; this occurred while rural population decreased until almost becoming non-existent during this period. The participation of people in intraregional exchange networks increased ten times during this period; but it continued to be quite restricted and sporadic (the proportion of Guanacaste ceramics was only 0.46%).

Population in the Central Highlands kept growing and this prompted competition over resources. Population aggregation in some settlements was striking; while there were fewer sites during this period they were larger and denser, some with populations of several thousands. Settlements nucleated into larger sites characterized by Snarskis (1984: 226-227, 2003: 194) as "small ceremonial centers (perhaps better characterized as city-states)," which had rudimentary architectural features like earth-filled, cobble-faced mounds and cobble-paved causeways. These centers have been interpreted as the locus of ceremonial encounters between the ruling group and the rest of the population or the redistribution of goods. Site location during this period becomes random, which has been taken as support for a regional picture where factors other than agriculture were predominant (Findlow, Snarskis, and Martin 1979). More specifically, site location seems to have been determined by sociopolitical boundaries and defense, as well as agricultural needs (Snarskis 1981a: 62-63; 1984a: 229; 1987: 113). This defense location has been described as a reaction against increasing population pressure and competition for resources. Apparently the subsistence economy was similar to previous period, just intensified (Fonseca 1992: 165). A marked task specialization was a common feature of the societies of this period; specialists were mainly focused on the production of elite sumptuary goods. Also there was mass and intensive use of labor for complex constructions and statuary production. This specialization was complemented with more trade in commodities and strong redistributive systems (Fonseca 1992: 188-192). Regional trade incorporated more functional items, as well as elite symbols of status. Exchange with people from Guanacaste again became especially strong between 800 and 1200 A.D., but now involved a "more generalized, widespread system reflecting commercial, as well as

ideological, relations" (Snarskis 1984b: 38, 41; Snarskis and Ibarra 1985: 59, 62). A strong social hierarchy is recognized during this period; sociopolitical complexity reached its apex in the Central Highlands during this period (Fonseca 1992: 165, 181; Snarskis 1987, 1992: 160). A process described as "balkanization" also began; large settlements broke into relatively small, agglomerated settlements for political control and defense (Snarskis 1981a: 84; 1987: 113-115; 1992: 160; 2003: 194).

The number of sites in the Central Pacific region increases during this period, as do their areas. A greater refinement of structures such as mounds, foundations, and paved causeways is found in some of the large settlements in the region. Principal settlements are characterized by "nuclear architectural units, surrounded by small habitation units and farming fields." Population also increased, as well as social complexity and labor differentiation. Agricultural activities associated with crop production continued developing, complemented by hunting, fishing, and gathering activities (Corrales and Quintanilla 1996: 106, 110). According to Corrales and Quintanilla (1996: 111) "the development of agricultural subsistence patterns, especially the exploitation of maize, allowed the population to have a food surplus, which permitted a related population growth…[and] increase in social stratification, reaching the level of 'chiefdoms'." As it occurred in the Central Highlands, exchange networks with Guanacaste increased in the period 800-1350 A.D. and drastically declined after that period (Corrales and Quintanilla 1992: 113, 124; 1996: 116).

In the Arenal region, village economic autonomy was maintained throughout the pre-Columbian sequence, in spite of variations in population densities, distributions, and contacts with outside societies (Sheets 1992: 32-34). This period witnessed a population decline,

indicated by a decrease in the number of occupied villages and their sizes, although there were a few large sites. In contrast to the previous period's settlement pattern of scattered small and medium sized villages, this period is characterized by many small hamlets widely dispersed across the region. The trend toward more elaborate funerary practices, evident in the previous phases, seems not have continued during this phase. A strong contact with the Guanacaste region was evident during this period, but a turn in "cultural affiliation" away from Guanacaste and toward the Central region took place by the end of the pre-Columbian sequence (Sheets 1994: 317).

Settlements in the Central Guanacaste region were during this period, few, diverse, and located in lowlands, in close proximity to rivers. Indeed the number of sites decreased from the last period. However some villages during this period became larger and house architecture more complex (including the use of bahareque and their location atop earth mounds). Unlike other periods, some settlements present a long, extended occupation, which indicates that the population was now fully sedentary. Subsistence relied on fishing, hunting, and cultivation; including the domestication of certain animals. Apparently some soil depletion took place during this period, which prompted the exploitation of new niches, including river flood zones. Task specialization seems to have emerged during this period. Groups settled in the region were hierarchical, but this hierarchy applied only within each autonomous village (Guerrero and Solís 1997: 210). At this point in the pre-Columbian sequence, Guanacaste region was participating in a wide-ranging exchange network that included vast regions of Central America; even immigration of Mesoamerican groups to Guanacaste apparently took place around 800-

900 A.D. (Baudez 1967: 212; Chávez 1998; Guerrero and Solís 1997: 43, 63, 124; Fonseca 1992: 190-191).

Summarizing the accounts from the different regions during this period, population increased in the Central Pacific region while it declined in the Arenal and San Ramón regions. Population in the Central Highlands and Central Guanacaste seems to have remained stable from the last period. Subsistence economy seems to have been similar in all the regions; people, independent of the regions, were practicing agriculture, fishing, hunting and collecting. During this period the San Ramón region was organized at the chiefdom level; this sociopolitical configuration was already present in the Central Highlands and the Central Pacific regions since the last period. In contrast the autonomous villages present in the Arenal region fragmented during this period into small, dispersed hamlets, probably returning to an egalitarian structure. The sociopolitical picture during this period in the Central Guanacaste region is similar to the one described for San Ramón during the previous period: limited social hierarchy probably only at the village level. All the regions were engaged in interregional exchange networks during this period, and an increase in the participation is noticed in all of the regions except for Arenal. However, the volume of exchange of goods seems to have been much more important in the Central Highlands, the Central Pacific and the Guanacaste regions than in the San Ramón region.

6.0 EVALUATING THE RELATIONSHIP BETWEEN PRE-COLUMBIAN SOCIAL CHANGE AND INTERREGIONAL INTERACTION IN SAN RAMÓN

In this chapter, the results obtained through the comparison of pre-Columbian trajectories of sociopolitical development from neighboring regions were used for evaluating the suitability of models of social change for explaining social change in west and central Costa Rica. Each model was evaluated by contrasting its derived expectations against the evidence coming from San Ramón and neighboring regions. By doing this it was possible to assess the importance of interregional relationships in the sociopolitical development of the San Ramón region during pre-Columbian times and neighboring regions.

The trajectories of social change for San Ramón, Arenal, Central Highlands, Central Pacific and, Central Guanacaste regions were reconstructed in the previous chapter around four major topics: sociopolitical organization (Figure 6.1), settlement pattern (Figure 6.2), regional population (Figure 6.3), and interregional exchange (Figure 6.4). A look at these variables allowed us to characterize the broad patterns of social change region by region, and by comparing and contrasting them among regions we can advance our knowledge about ancient social change. We already know that sometimes these variables correlate and sometimes they do not (Drennan 1987: 319; Feinman Neitzel 1984; Sanders 1984: 22-23). However, by attempting to account for this variability in different parts of the world we can hope to learn

about the different sociopolitical paths ancient societies took, and under which conditions they did it.

6.1 EMPHASIS ON LOCAL PROCESSES

As discussed in Chapter 1, these models argue that social change was driven by factors internal to the region. Even though extra-regional relationships may have contributed to the process of social change, processes of internal origin and development were the main source of sociopolitical transformations. Accumulation of surpluses in food staples derived from control over highly productive agriculture, agricultural intensification or subsistence innovation (Gilman 1976, 1981, 1991, 2001; Earle 1991, 1997); control over labor (Arnold 1995); internal warfare and ecological circumscription (Kirch 1984; Hass 2001); environmental risk (Spencer 1993, 1994); and competitive feasting (Clark and Blake 1994, Stanish 2004) are some of the factors that have been described as mainly working within a given region. Because of the regional specificity of these factors, there is no reason that the nature or timing of social change in one region should be very similar to that of other regions. In other words, if purely internal factors were producing changes in the trajectory of social change of a given region we would not expect it to affect the trajectories of societies in neighboring regions. Therefore the various regional trajectories should have little or no resemblance to each other.

Clearly sociopolitical organization (Figure 6.1) in the Arenal and Central Guanacaste regions seems to not to have been affected for what was going on in their neighboring regions. The trajectory of social change in the Arenal region diverged from neighboring regions early on

in the pre-Columbian sequence. While at the beginning of the sequence a high degree of mobility (Figure 6.2) is detected in all the other regions compared, people in Arenal were sedentary and lived in small hamlets. During the first centuries A.D. population increased and hamlets became larger, but these processes seem to have been much slower and less pronounced in Arenal than in the other regions. Social hierarchy (Figure 6.1) beyond the household level seems to have barely existed in the region and during the last millennium of pre-Columbian life—when the rest of the regions were at the apex of sociopolitical complexity—in the Arenal region small villages disintegrated into scattered hamlets (Figure 6.2). On the other hand, in the Central Guanacaste region, population did not become completely sedentary until very late in the sequence, long after other regions. Intensive interregional exchange (Figure 6.4) was present in the region during the whole pre-Columbian trajectory even when it decreased in other regions. Sociopolitical structure (Figure 6.1) seems to have varied little through time, and social hierarchy seems never to have expanded into a regional scale. When villages in Arenal were splitting off into small hamlets (Figure 6.2), in Central Guanacaste villages and hamlets were becoming larger.

The comparison of the pre-Columbian trajectory of social change in the San Ramón region with the trajectories of the Central Highlands and the Central Pacific regions brings to light a much more complex interplay between variables. Certainly the sociopolitical trajectories of the three regions (Figure 6.1) are identical when considering only the directionality of the political changes—going from autonomous households to autonomous villages to chiefdoms. However, the emergence of autonomous villages (Figure 6.1) did not occur in San Ramón until about 500 years after it happened in the other two regions. Chiefdoms did emerge in all three

regions, not at the same time at all. The difference in timing was approximately 300 years between the Central Highlands region (sometime around A.D. 0) and the Central Pacific region (around A.D. 300). The same transformation did not occur until 600 years later in the San Ramón region (around 900 A.D.).

This similarity in trajectories among these three different regions, but with different pacing, is also clearly reflected in the comparison of settlement patterns (Figure 6.2). A combined hamlet/village settlement pattern seems to have emerged at about 400 BC in the Central Highlands and Central Pacific, and around 300 AD in San Ramón. A much more abrupt difference is noticed around the year 1000 A.D. when villages predominated in San Ramón while "city-state like" settlements (as Snarskis [1984: 226, 1987: 113; 1992: 160] describes them) had replaced large villages in the Central Highlands and Central Pacific regions. Also, an abrupt increase in population is observed in the Central Highlands and Central Pacific at about 400 BC and in San Ramón at 300 AD, which puts it 700 years after the other two regions (Figure 6.3). Finally, the population pattern coincides with emergence of autonomous villages in the same way in each (at separate times)—abrupt increase in population is notice before the emergence of chiefdoms and it is followed by a moderate decrease in population. This happens in San Ramón with a difference of 700 years respect to the Central Highlands and Central Pacific regions.

In sum, the broad differences in the pacing of political transformation between pre-Columbian San Ramón and the other two regions (Central Highlands and Central Pacific) indicate that the trajectory of San Ramón was mostly independent from the events that happened in the Central Highlands and the Central Pacific regions. In addition, the San Ramón

region always had only weak participation in interregional exchange networks (Figure 6.4), experiencing just a mild increase around 900 A.D., whereas the other two regions were strongly engaged in interregional exchange from 0 to 1200 A.D.

Thus, probably the same set of variables that drove social change in the Central Highlands and Central Pacific regions also propelled in the San Ramón region, but much later in time. Both hamlets and villages emerged in the Central Highlands and Central Pacific regions, and with them a rapid increase in sociopolitical complexity (Figures 6.2 and 6.3), following an abrupt increase in regional population. The same sequence of events is seen in San Ramón, although somewhat more gradually and 700 years later. In all three regions, though, the emergence of autonomous villages (which happened at different times in different regions) was accompanied by an abrupt population increase. This suggests that internal processes were at work connecting these two things in the same way within each region; the timing of this sequence of events is too different in the different regions to be attributed to interregional connections.

6.2 EMPHASIS ON DYNAMIC RELATIONSHIPS BETWEEN NEIGHBORING REGIONS

In this model social change is propelled by interregional relationships among elites inhabiting and ruling over regions having different natural settings, resources, and sociopolitical constitutions (Langebaek 1991). Exchange among elites of goods which complement those found locally—such as minerals, plants or wood, fauna, foodstuffs, or specialized manufactured

crafts—would have provided to an emergent or established elite the economic and/or ideological support needed for either increasing their power or maintaining the status quo. According to this model participating regions would be close enough to each other to make continual exchange of goods feasible. Because the relationship among regions in this model is mostly an economic one, the sociopolitical organization of the participating regions would not have shown much direct influence; thus societies in different regions would have distinct trajectories. Nevertheless, because the transactions in goods would support the emergence or continuity elites, these networks would have prompted simultaneous changes of quite likely different character in the sociopolitical trajectories of participating regions. Thus, if interregional relationships were affecting social change in the way just described, neighboring regions having complementary environments would have different trajectories, but changes in their sequences would have occurred contemporaneously.

The Central Highlands, Arenal, and San Ramón regions have similar environmental settings (elevations above 800 m.a.s.l., average temperature around 23° C, mean annual precipitation above 1800 mm, and fertile, volcanic-origin soils); therefore these three regions contain rather similar natural resources. The contrasting environments these models focus on are found in the coastal and humid Central Pacific region and in the dry and hot Central Guanacaste region. While the inhabitants of the San Ramón region would have enjoyed quite benevolent natural conditions (see Chapter 2), people living in the Central Guanacaste region were likely affected by soil depletion, occasional droughts and major river flooding (Coe and Baudez 1961: 506; Guerrero and Solís 1997: 124). On the other hand, we already know that Guanacaste ceramics and green stone artifacts were highly value in pre-Columbian Costa Rica,

and that indeed people in San Ramón had some degree of exchange with Guanacaste inhabitants. Thus, the presence of an exchange network based on the transfer of foodstuffs from San Ramón to the elite of Central Guanacaste, in exchange for manufactured goods from the Central Guanacaste region, is a feasible scenario.

Looking at the sociopolitical trajectories of the two regions (Figure 6.1) it is possible to see that there is one set of simultaneous changes, around 900 A.D. At this point of the sequence autonomous villages were integrated into a chiefdom in the San Ramón region and autonomous villages emerged in the Central Guanacaste region, and it was also around that time when village life was fully developed in the two regions (Figure 6.2). Before the emergence of villages in the Central Pacific region there was an increase in population (Figure 6.3), this process might have been involved in the deterioration of soils observed after 900 A.D in that region. In such a situation, people having a preferred access to foodstuffs would be in a position to draw dependents together, thus creating small communities such as villages. This might explain why, before 900 A.D., changes in the sociopolitical trajectory of San Ramón did not have any impact on the Central Guanacaste region: despite continual contact, dynamic relationships between the regions were not activated as long as soils in Central Guanacaste were still productive enough. The elite in San Ramón could nonetheless have used prestige goods obtained from Central Guanacaste to increase their social prestige and power and to expand their territorial influence and integrate villages into larger sociopolitical units, as seems to have happened around 900 A.D., just when exchange with Guanacaste reached its climax (Figure 6.4).

As mentioned above, the Central Pacific region also has an environment that contrasts and complements San Ramón's. Being a coastal region, with warmer temperatures and less precipitation than San Ramón, the Central Pacific region may have offered not only access to maritime and coastal goods, but also to any other item being imported by sea trade (Creamer 1982; 1983: 255-262; 1992). Indeed the Central Pacific region has been taken as one of the possible “gateways” for imported goods from Guanacaste into the Central Highlands region (Corrales and Quintanilla 1992: 112; Snarskis and Ibarra 1985: 61). Looking at the trajectories of social change (Figure 6.1), by 300 B.C. people in the Central Pacific lived in autonomous villages when in the San Ramón region people still lived in scattered households; in addition, around that time there was an increase in population in both regions, being just moderate in San Ramón and possibly more abrupt in the Central Pacific region (Fonseca 1992; Snarskis 1981a). However, around that time families in San Ramón started to form tiny hamlets (Figure 6.2), not very long after both hamlets and villages were present in the Central Pacific region. Three hundred years later, around 300 A.D., there is a clear coincidence in the trajectories of social change of the San Ramón and Central Pacific regions: people in San Ramón started living in autonomous villages while chiefdoms emerged in the Central Pacific region. After this moment in the pre-Columbian sequence of both regions there are no more coincidences in their trajectories. Thus, the evidence would support a hypothetical scenario where 600 years before the elite from San Ramón increased their ties with the Central Guanacaste region, they were mainly oriented towards the Central Pacific region. An interest in obtaining complementary goods from the ones locally produced could have driven the connections of San Ramón elite

with the elite of the Central Guanacaste and the Central Pacific regions, even though the sociopolitical configurations were unequal.

Sheets (1994: 317) has indicated that "Cordilleran people maintained primary cultural affiliations with Greater Nicoya to the west" until after 1300 A.D. when there was "a turn in cultural affiliation away from Greater Nicoya". It was pointed out above that the only shift in the sociopolitical organization of the Central Guanacaste region happened around 900 A.D. (Figure 6.1). In contrast, two changes were detected in the trajectory of Arenal—neither of them contemporaneous with the one in Guanacaste. One occurred around the time of Christ, and the second around 1200 A.D. In addition, settlement reorganization (Figure 6.2) took place in Arenal approximately 300 years after it did in Central Guanacaste, and while in Central Guanacaste a single shift in population size (Figure 6.3) has been described around 300 A.D., changes in the population of Arenal occurred 300 years before and 300 years after that single event in Central Guanacaste, and a third one happened much later. In conclusion, there was no chronological correspondence between changes detected in the sociopolitical trajectories of Arenal and Central Guanacaste.

Corrales and Quintanilla (1996: 117) have suggested that people inhabiting the Central Highland region have had access to maritime resources, among other goods, through exchange networks with the Central Pacific region. Looking at all the variables compared here (Figures 6.1 to 6.4), it is evident that there was a high degree of correspondence among events taking place in the Central Pacific region and the Central Highlands. However there are two aspects of these changes that tell us that we are looking at a different phenomenon than the one implied in the Emphasis on Dynamic Relationships between Neighboring Regions model. The first aspect is the

directionality of the change, both trajectories changed in the same direction: from household autonomy to autonomous villages to chiefdoms (Figure 6.1). Changes in settlement patterns seem to have also been identical: from dispersed semi-mobile populations, to hamlets and villages, to predominance of villages (Figure 6.2). The same can be said for variations in population size, when both regions had an abrupt increase in population size around 500 B.C. and a moderate decline around 300 A.D., even though a moderate increase apparently took place around 900 A.D. in the Central Pacific region while population in Central Highlands seems to have remained stable. The other aspect has to do with something already mentioned above: exactly when in the sequence of sociopolitical change these changes occurred. The sociopolitical transformations in the trajectory of the Central Highlands region happened just briefly before they took place in the Central Pacific region.

These two characteristics are exactly what one would expect to see if the type of interregional relationships described by the third, and last, family of models evaluated here were acting in these two regions during pre-Columbian times.

6.3 EMPHASIS ON INTERACTION ACROSS MACROREGIONS

These models have received many different labels in the archaeological literature, such as “diffusion” (Childe 1925, 1936; Meggers and Evans 1957), “interaction spheres” (Caldwell 1964), “peer-polity interaction” (Renfrew 1986), “emulation models” (Renfrew 1975; Goldstein 2000), “rapid evolution” (Flannery and Marcus 2000), and “world systems” (Blanton and Feinman 1984; Hall and Chase-Dunn 1993). All these models have in common that social

change is understood as the result of interregional relationships through which a network of different societies, located over very large territories (Kepecs and Kohl 2003), “influence” each other's sociopolitical configurations. This “influence” can come from a clearly distinguishable leading society or not. Indeed, some models have been focused on cases where such primacy cannot be recognized, sometimes because changes across the entire network of participating regions happened within very short periods (peer-polity interaction and rapid evolution models deal primarily with this issue). The range of mechanisms through which this “influence” took place goes from “trait transmission” and replacement through migration or colonization (the main mechanisms found in classical diffusion theories) to the transfer of “esoteric knowledge” and social prestige enhancement (as emphasized by emulation models). Thus, in contrast to the previous family of models, these models emphasize the political and ideological repercussions of interregional relationships, rather than the economic aspect of the exchange.

According to these models, societies participating in an interregional network not only should have experienced rather simultaneous changes in their trajectories but also should have followed very similar, if not identical, sociopolitical paths. The degree of simultaneity of the changes depends on the existence of a “center”, “core”, “advanced” or “leader” region—as some of the models (specifically, diffusion and world systems models) argue—and also on how far away the regions are located from each other. The regions compared here are very close to each other: within an area of 20,000 km², in contrast to entire continents such as Europe and Asia (Childe 1936; Shennan 1982); thus changes in these regions should have spread quite quickly among them, in comparison to the pace of trait diffusion expected at the continental and subcontinental scales. Either because a core region homogenizes the sociopolitical

panorama of the peripheral regions by transmitting its traits to them (as in diffusion, emulation, and world system models) or because of a homogenizing process through reciprocal multilateral influence (as in interaction sphere, peer-polity interaction, and rapid evolution models), it would be expected that the same sociopolitical paths are found in all the regions. Finally, because the economic aspect of the interregional exchange is not emphasized in these models but instead the ideological and political facets of the relationship, an environmental or labor-related complementarity among the participating regions does not need to be demonstrated.

The trajectories of social change compared in Figures 6.1 and 6.2 show us that three regions—the San Ramón, Central Highlands, and Central Pacific regions—developed in an identical way. Sociopolitical organization in these regions went from household autonomy to autonomous villages to chiefdoms (Figure 6.1), while the settlement pattern went from dispersed and probably semi-mobile groups to sedentary hamlets, to villages (Figure 6.2). However, as discussed above, the two major changes in the trajectories occurred first in the Central Highlands and Central Pacific regions and much later on in San Ramón—900 and 600 years later, respectively. This broad span of time in regions located so close to each other (on average, 60 km from the center of a region to the center of the other), is a clear indicator that changes in the Central Highlands and Central Pacific regions were not driving the sociopolitical trajectory of the San Ramón region.

Focusing now only on the trajectories of the Central Highlands and the Central Pacific regions, the situation is different—changes in the Central Highlands were identically replicated in the Central Pacific region, almost immediately (Figure 6.1). Between these two regions there

was a “leader” or “core”; the sociopolitical configurations that emerged in the Central Pacific were present slightly earlier in the Central Highlands, around 200 to 300 years before.

However a different scenario is evident when looking at changes in settlement patterns. The settlement pattern (Figure 6.2) in the Central Highland and Central Pacific regions seems to have gone through a process of “rapid evolution”, a perfect synchrony in changes in this social variable is noticed throughout their entire pre-Columbian trajectories. Apparently this also applies to changes in population in the two regions (Figure 6.3); however we have still very little information about this issue for the Central Pacific region. In addition, changes in interregional exchange (Figure 6.4) documented for the Central Highlands are the same as those described for the Central Pacific region, happening simultaneously and in the same directions, except for the fact that interregional exchange in the Central Pacific region at the beginning of its sequence was less intensive than in the Central Highlands.

Thus, practically the same processes of social change observed in the Central Highlands region are observed in the Central Pacific region very slightly later. Changes in sociopolitical organization follow the pattern expected of diffusion (or core-periphery) from the Central Highlands to the Central Pacific. Settlement pattern changes and shifts in interregional exchange seem linked in a process of rapid evolution, where changes in one region are quickly replicated in the other region. Thus, the similarity in *cultural* materials (Corrales and Quintanilla 1996; Snarskis 1981a; Stone 1958, 1966, 1977) noticed between these two regions for so long seems to actually have corresponded with similarities in sociopolitical processes.

On the other hand, it is relevant to think again about the scale of these processes. While models that emphasize local processes are focused on single regions and models that

emphasize dynamic relationships are centered on neighboring regions not far apart, the last family of models, as its name says, emphasize processes happening over *macroregions* (Kepecs and Kohl 2003). For example, within America we find these models described as acting at the scale of regions such as "Mesoamerica" (Braswell et al 2002; Carmack and Salgado 2006; Diehl 2005; Diehl and Coe 1995; Neff 2006; Schortman and Urban 1992; Smith and Berdan 2003), the "Isthmo-Colombian area", (Fonseca and Cooke 1993; Hoopes 2005; Hoopes and Fonseca 2003), "Lower Central America" (Snarskis 1984a, 1986; Stone 1972, 1977), or the "Andes" (Goldstein 2000; Williams and Nash 2002). However, the present research has found such processes only between two of the five regions compared; that is, only at very short distance, within a territory of approximately 8110 km².

In conclusion, processes similar to those described for models that emphasize interaction among macroregions seem to have played role in pre-Columbian social change in two neighboring regions in Costa Rican territory—the Central Highlands and Central Pacific regions. Compared to the scale at which these processes are usually thought to operate—e.g. Central America and northern South America—this is a much more restricted scale. The results of the comparison presented here do not show the trajectories of social change in any of the five regions responding to political, economic, or ideological events in Central America, Mesoamerica or South America.

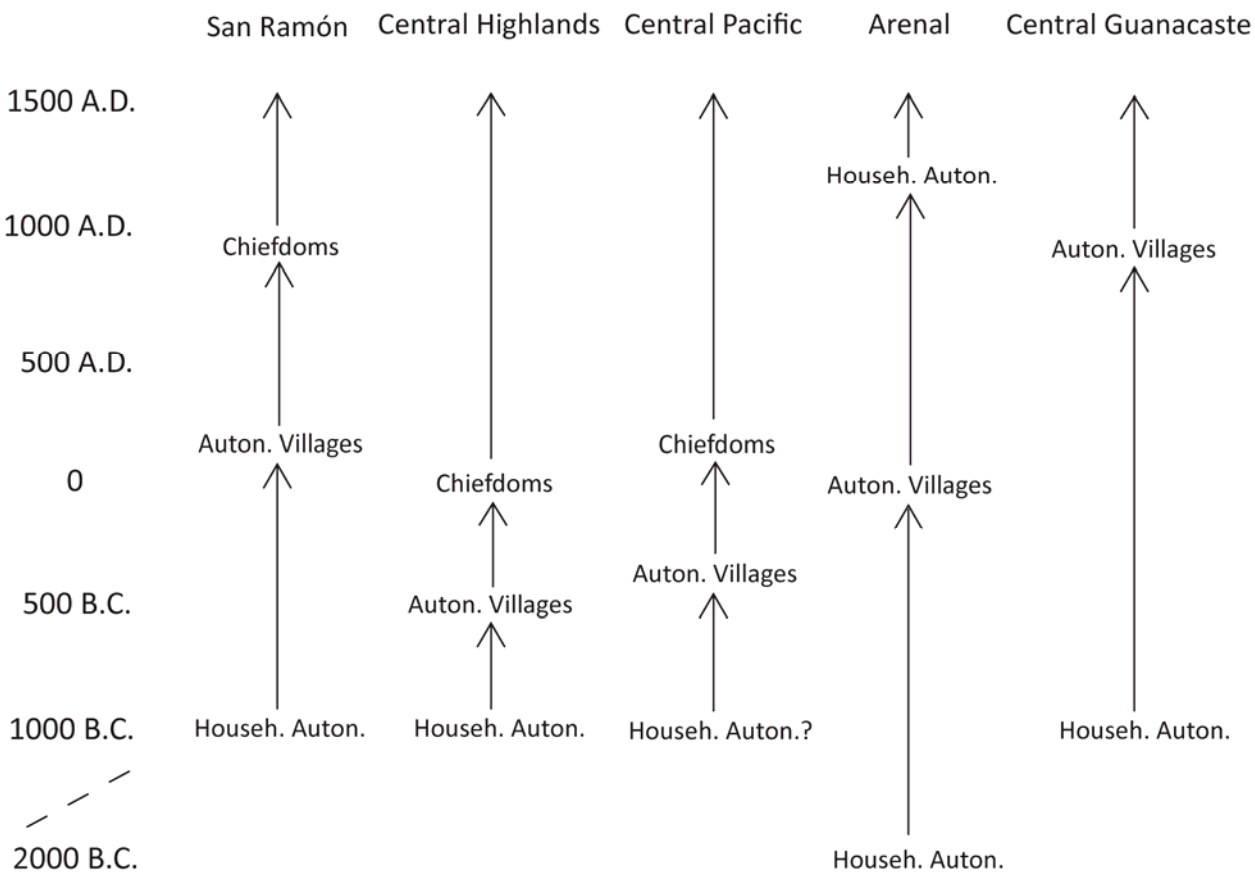


Figure 6.1. Comparing Variations in Sociopolitical Organization

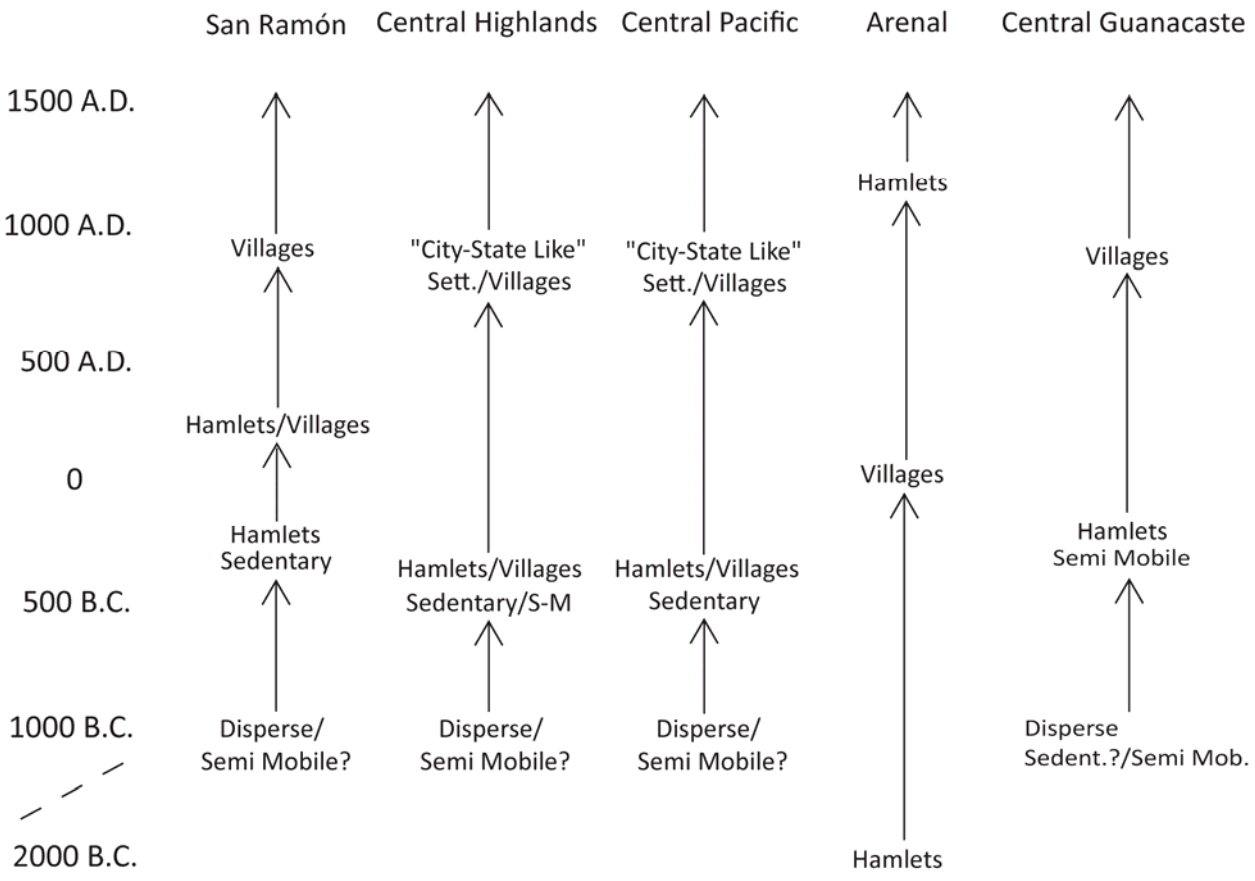


Figure 6.2. Comparing Variations in Settlement Patterns

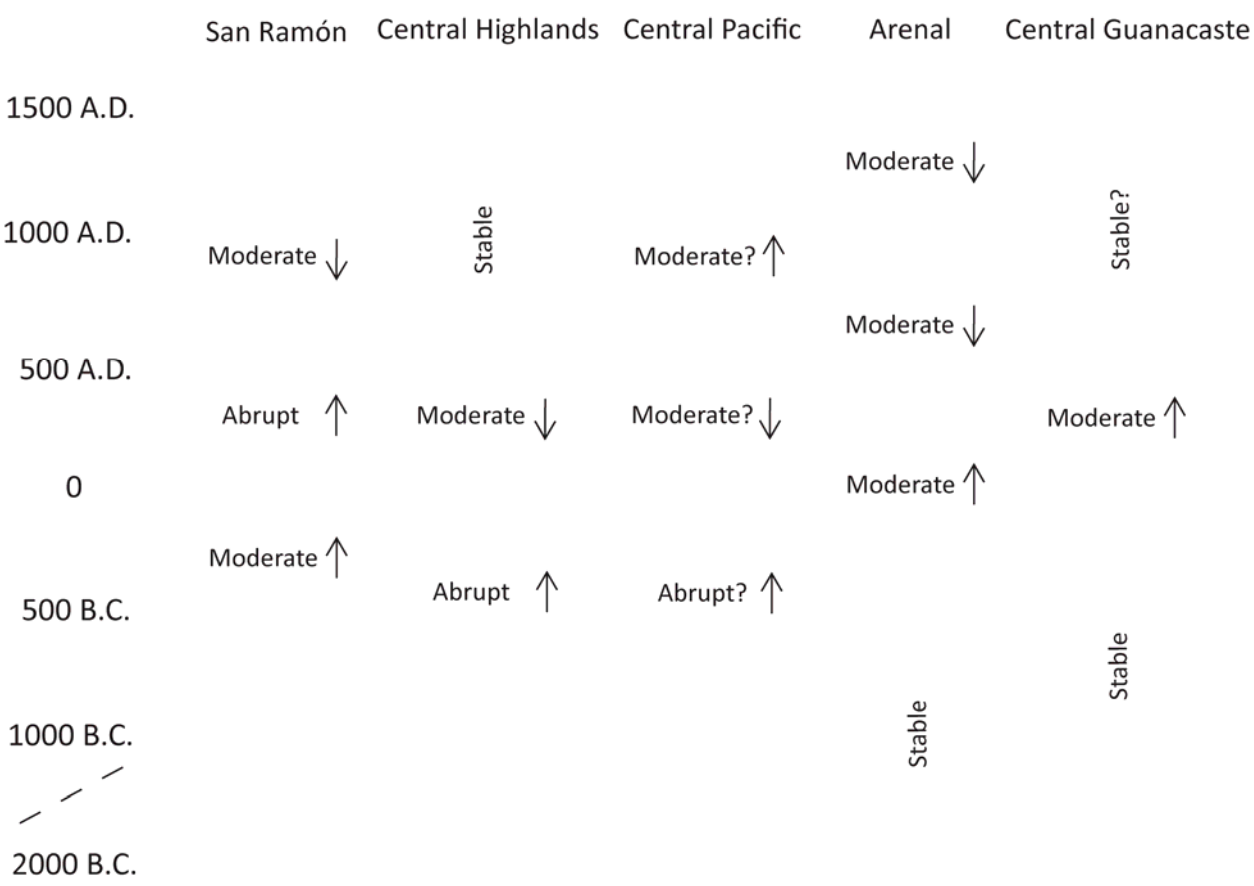


Figure 6.3. Comparing Variations in Population Size

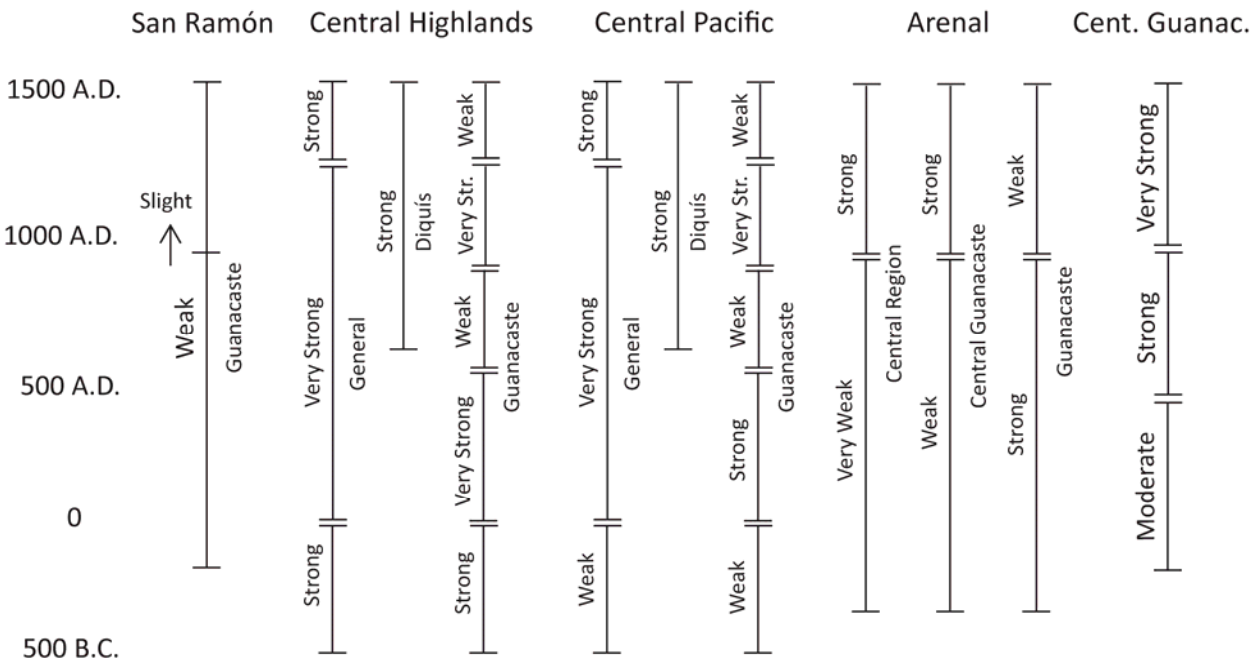


Figure 6.4. Comparing Variations in Interregional Exchange

7.0 SOCIOPOLITICAL TRAJECTORIES AND INTERREGIONAL RELATIONSHIPS: IMPLICATIONS FOR MODELS OF PRE-COLUMBIAN SOCIAL CHANGE AND FURTHER RESEARCH

Several implications can be derived from the results of the present research. On the one hand, there are implications for the role assigned to local and external factors in models of ancient social change. Because these models have been central in guiding archaeological research in Central America, these implications extend to the way that pre-Columbian social change has been understood and described for Central America and more specifically for Costa Rica. On the other hand, there are also implications for future archaeological research. Comparing and contrasting data coming from five different regions has made very conspicuous the disparities in type and amount of information available from them. Thus, one of the goals of this final chapter is to provide a general view of how future work may help to fill the gaps.

7.1 IMPLICATIONS FOR MODELS OF SOCIAL CHANGE

As we saw in the previous chapter, the weight of interregional relationships in social change varied depending of two different axes: time and space. Not surprisingly, people in one region may turn on and off relationships with other societies (as was the case between San Ramón and

the Central Guanacaste or Central Pacific regions). Such relationship between regions may also have been constant and unchanging through many generations (as in the case of the Central Highlands and Central Pacific regions). And finally some regions may never have become involved in interregional exchange networks, or at least not in such a way that interregional relationships would have a major impact on their sociopolitical trajectories (as in the case of the Arenal region). The interweaving of time, space, and interregional relationships is well illustrated by the sociopolitical trajectory of pre-Columbian San Ramón: sociopolitical changes there were mostly molded by internal factors—probably the same factors that acted early on in the Central Highlands region, and passed from there to the Central Pacific region. However, economic relationships with the Central Guanacaste and Central Pacific regions, separately, also contributed to social change in San Ramón at two different moments in its sequence.

Social change in Central America has been understood primarily from the perspective of the models here encompassed under the label "Emphasis on Interaction across Macroregions". These models have dominated the understanding of how societies in the isthmus changed during pre-Columbian times. In the early models (Snarskis 1984a; Stone 1972; Willey 1971) change came from Mesoamerica and South America into Central America. Recently, these models have gained a fresh impetus thanks to the introduction of concepts such as "Isthmus-Colombian region" and "diffuse unity" (Fonseca 1998; Hoopes 2005; Hoopes and Fonseca 2003), but now with an emphasis on social change coming from interregional relationships within Central America and northern South America.

The comparison of five regions within Costa Rican territory has shown how complex interregional relationships are. Even though interregional exchange certainly existed in all the

five regions, the impact these contacts had on sociopolitical events was different in each region. In addition, as should be expected, the impact of interregional relationships on other aspects of a given society depends on the direction of these contacts. While in some cases interregional relationships were related to sociopolitical events happening in the participant regions, in other cases this did not happen. In some regions interregional relationships were very specific—for example only economic—in other cases they seem to have been economic and ideological. For some regions that were integrated in networks of interregional exchange, these transactions had little impact on sociopolitical events. Furthermore, all of these situations also vary substantially through time. Thus, as commonly happens in social sciences, the question of whether interregional relationships were important in pre-Columbian social change does not have a simple yes or no answer. Instead, it depends on where you look and when.

Interregional relationships played a major role in the trajectories of social change of *some* regions, *sometimes*. The role of interregional relationships in Pre-Columbian social change was not uniform across territories as large as Central America or even Costa Rica. Logically, the same applies to the role of local factors in models grouped under the label "Emphasis on Local Processes."In some regions local processes had a major impact on pre-Columbian sociopolitical change, but external factors also exerted strong forces from time to time. Certainly when major events happened in the sociopolitical trajectories of the San Ramón and Central Guanacaste regions they coincided with the launching of economic relationships with other regions, but their trajectories were mostly shaped by factors of internal origin (according to the "Emphasis on Dynamic Relationships between Neighboring Regions" models). More purely local factors also seem to have driven the trajectory of social change of the Arenal region. Thus, just the

sociopolitical trajectory of the Central Pacific region seems to have been entirely shaped by interregional relationships, being the Central Highlands the source of change.

The study of the role interregional relationships played in prehistoric social change will require building more sophisticated models which take into account variations of local and external factors depending on time and space. Future models should acknowledge the changing nature of natural environments and social factors. By doing this, they will be in position to help us understand what conditions make interregional relationships or local relationships crucial for processes of social change (e.g. Spencer 1993). It is also necessary that future models take into account the different character of interregional relationships (e.g. economic, ideological, elite-oriented, socially disseminate), the sociopolitical scale of the societies that might be involved in the exchange network (e.g. Langebaek 1992), and, finally but no less important, the multidirectionality of these relationships—models should take into account that a given society might have different relations with different regions at a particular time, and that these relationships might change through time.

7.2 IMPLICATIONS FOR FUTURE RESEARCH

Building up more sophisticated models for evaluating the role of local and external factors in pre-Columbian social change is not all that is required for advancing our understanding about how societies changed in the past. The evaluation of models focused on social change (as distinct from *artifact* change) will require collecting data about change in social variables

(Flannery 1973) such as demography, settlement distribution, subsistence, and labor specialization.

A series of expectations about what we should find when research at other scales of analysis is implemented in the five regions compared here can be derived from the initial conclusions offered in the previous chapter. These can serve as lines of examination for future research, specifically designed to obtain the kinds of evidence required to evaluate these expectations, in order to determine whether they are on the right track or if, instead, the evidence points to different paths of investigation. The integration of multiple scales of analysis in archaeological research in multiple regions will be essential for this task.

Obviously, the use of any scale of analysis will eventually generate questions that require incorporating other scales of analysis, either larger or smaller ones. This does not mean that they are exclusive, but the contrary—they are complementary in the study of any social phenomenon. The internal study of villages and hamlets will shed light on the nature of social relationships formed by the people of San Ramón, for example. Obviously this will require the implementation of smaller scales of analysis than the regional settlement study discussed in previous chapters. Toward the oppostie extreme, if we want to know what were the political borders of the chiefdom present in the San Ramón region in the period 900-1550 A.D., we would need to expand the surveyed area, by several hundred square kilometers at least, in order to look at the distribution of settlements beyond the area already studied. The fact that these varied scales of analysis are by no means exclusive—but instead fully complementary—does not mean that there is not a better scale among them for answering a particular set of questions (Drennan 1996b). Just as answering questions related to prehistoric art and symbolic

representation requires finding and studying the artifacts or monuments where those phenomena can be observed, the study of sociopolitical change requires finding and studying the settlements whose interrelationships created that political phenomenon. Trying to find prehistoric art by full-coverage survey of a surface of 110 km² would be quite inefficient (as opposed to excavating burials, houses, and public structures). In just the same way, trying to understand the political configuration of a region just by excavating individual burials and houses would not be feasible.

7.3 REGIONS, COMMUNITIES, AND POLITICAL PHENOMENA

In the present research the units of analysis for comparison have been regions, whose size and coverage have been defined for archaeologists either because of similarities in the archaeological record, geographic characteristics and homogeneity, budget and goals, or a combination of some of these reasons. The definition of regions is a very important task in archaeology—it is just an unavoidable first step for understanding the scale and distribution of sociopolitical events. However, there is no reason to think that there is a perfect correspondence between a given region and a political entity (e.g. chiefdoms, autonomous villages); instead it is quite possible that large regions—such as the ones compared in the present research—have several political entities within their borders. If one is interested in the study of sociopolitical processes then, at the end, it is not the interaction among entire regions what we are interested to study but the interaction among political entities. Supralocal and local communities are entities commonly with a scale smaller than regions (Peterson and

Drennan 2005), and because they are defined *within* regions based on differences in separation distance and population size, they are entities less subjectively defined than regions. Thus, by defining supra-local communities or local communities and studying their relationships, we would be more confident of looking at real political events, than if we looked just at regions.

7.3.1 The San Ramón Region

The present research has suggested that factors internal to the region played a major role in the sociopolitical trajectory of the San Ramón region. Future work in the region can investigate what local factors were most relevant in propelling the political events that have been described for the region during pre-Columbian times. For example since there was a moderate increase in population before autonomous villages emerged in the region, and an abrupt increase just before a chiefdom political system came into existence, increasing regional population seems to have been one of the factors directly related with increase in sociopolitical complexity. Pressure onr natural resources and social circumscription were, however, quite improbable in the San Ramón region, especially taking into account the dispersed settlement pattern and low regional population density observed before the emergence of a chiefdom in the region, and the high productivity of the soils.

Nevertheless, population increase can create pressure on managerial tasks at the societal level not related to control over natural resources (Wright 1977). More people in a given region create new and increased demand for services; thus a major increase will push political, ideological and economic institutions to reorganize and probably also to specialize—

independently of the scale of the society—in order to deal with the new social requirements. For example, changes in the numbers of people living near each other will provide better or worse conditions for increasing political leadership, given the logistics involved in implementing political control over a territory (Drennan 1987). If social institutions do not quickly adapt to the needs introduced by changes in social variables such as population, however, they will probably collapse.

For the San Ramón region the present research provided information about sociopolitical entities such as local and supralocal communities. For example, the results indicate that sometime during the period 1000 B.C.-300 A.D. a small house was located on the western bank of the Barranca river. During the next period (300 B.C.-300 A.D.) a few more families inhabited the western side of the river and a similar number of families settled on the eastern side. By the next period (300-900 A.D.) 20 to 40 people lived spread out in an area of approximately 85 hectares, and during the last period (900-1550 A.D.) the number of people living in that same area increased considerably to between 70 and 140 persons. On the other hand, the Volio site was occupied by a couple of families sometime during 300 B.C. and 300 A.D.; during the Curridabat phase the site reached an extension of around 35 hectares, which did not change significantly until the Spanish Conquest. During the period 300-900 A.D. between 60 and 120 persons inhabited the site, and this number slightly increased during the following period (900-1550 A.D.) to between 95 and 190 people.

A closer look at these communities, including their function or multiple functions can provide insight about how they reorganized internally and changed. Clearly a given settlement can have, simultaneously, different functions (ceremonial, administrative, residence); especially

when we are dealing with non-state societies. However, these functions should be demonstrated and not just assumed. Research at the settlement level will be essential to elucidate settlement structure in relation to distribution of public and private space, and economic and religious activities, variations that can be monitored not only over a spatial axis but also over a timeline. Tracking these variations at the intra-community scale and comparing them with variations in population (see Chapters 3 and 5) will provide a better understanding of the role population increase had in the organization of politics, religion, and economy at the community level. Other social variables besides population size and density were tracked in San Ramón at the regional level (see Chapter 5), and these other variables can also be compared with changes internal to the communities.

The population of San Ramón seems to have had a strictly economic relationship with people in Central Guanacaste around 900 A.D., and this relationship seems to have also contributed to the sociopolitical changes taking place in these two regions around that date, probably by funding the political and ideological enterprises of emergent elites in both regions. Elites in the Central Guanacaste region seem to have become engaged in a local, small scale, political domination, while in the San Ramón region elites were trying to integrate larger territories under their authority. Therefore, it would be enlightening to study whether the communities in the San Ramón region had differential access to ceramics (practically the only preserved material in interregional exchange) from the Central Guanacaste region, especially around 900 A.D. when the increase of exchange with that region was detected. If the proposed scenario indeed occurred, it would be expected that the villages located at the core of the chiefdom had more access to prestige artifacts from Central Guanacaste. The data to evaluate

that issue is already available; the necessary information was collected during the fieldwork for the present research, and it will be processed during 2009.

7.3.2 The Central Highlands Region

The present research reveals that the factors that drove social change in the Central Highlands region acted only—among the regions compared here—in that region, and probably they were the same that much later on propelled increase in sociopolitical complexity in the San Ramón region. Thus, in order to advance our knowledge about social change it would be relevant to investigate what factors local to the region were acting in the Central Highlands region and compare them to the ones acting in the San Ramón region. This would tell us if they were actually the same or if, instead, different factors produced very similar trajectories of social change.

Agricultural intensification (because of the introduction of improved varieties of maize), population pressure and environmental circumscription (pressure on fertile land) have been advanced as immediate local factors propelling social complexity in the Central Highlands (Snarskis 1978: 293, 295-298; 1981a: 44; 1984a: 216; 1986: 112; 1992: 144). If so, the origins of intensive maize agriculture should have occurred just before population increase and emerging complexity started in the Central Highlands region. During the period of agricultural intensification the ratio of maize consumption in relation to tree products and tubers should have increased. This can be studied by excavating house floors looking for changes in consumption practices; for example, by *systematically* looking at changes in the presence and

distribution of paleobotanical remains and of tool assemblages related to processing certain types of food (e.g. maize versus tubers).

If an actual increase in food production (strictly speaking, agricultural intensification) was related to the shift towards grain agriculture this process might be especially difficult to detect in the archaeological record—agricultural intensification, especially in societies with such a small scale, should have had little to no impact on community structure, beyond a small increase in family size (Hirth 1992; Sahlins 1972). Increase in family size may be reflected in an increase in house size, thus a line of evidence to explore for agricultural intensification is variations in house size.

Population increase has already been inferred for the Central Highlands region (see Chapter 5); however we do not have any information about population size and density, or about variations in number and size of hamlets and villages. A systematic regional survey in the Central Highlands could help to document changes in these variables. A systematic regional survey, as has been shown in San Ramón, can tell us how social entities such as hamlets and villages changed in number and size, period by period, and also how regional population changed in the Central Highlands region, in relative and absolute numbers. On the other hand, the study of soil composition and its distribution in the Central Highlands region can tell us about the productivity of traditional agricultural techniques (e.g. Kirkby 1973). Thus, a systematic study that combines demographic and environmental data will tell us if population pressure was indeed present in the sequence of social change in the Central Highlands region. Additionally this information will facilitate a much more detailed comparison of these variables

with the San Ramón region and other regions in the world where this information has been already collected.

Finally, it has been proposed that political integration was accomplished in the Central Highlands region through ideological control and ritual monopolization related with agricultural fertility by an ascendant elite. This sociopolitical scenario can be further tested by studying the mechanisms of community integration and differentiation in the process of hamlet and village formation (Shelach 2006) in the Central Pacific region. Community formation in the Central Highlands region should have been linked to ritual practices related to fertility after 300 B.C., when hamlets and villages started emerging in the region and when population increased substantially. Communal spaces exclusively dedicated to ritual activities—and their related paraphernalia—should be recognized within villages and hamlets (Renfrew 1994), and these communities should have emerged and organized around these sacred spaces. A systematic study focused at the hamlet and village level will be crucial in order to understand the internal organization of these settlements, the distribution of space, and their uses.

7.3.3 The Central Pacific Region

People in the Central Pacific and Central Highlands regions seem to have had more than just a purely economic relationship; this is evident because of the fact that sociopolitical events occurring in the Central Highlands were replicated in the Central Pacific region. The relationship between these two regions was not of peer or equal polities, but instead of a leading region having a unidirectional influence over another, which progressively reorganize itself like the

leader one. Evidently, this is precisely the scenario that diffusion, world systems and emulation models propose, especially taking into account how close are these two regions located from each other.

As for any archaeological region in any part of the world, the delimitation in space of the Central Pacific and Central Highlands regions has been only for analytical purposes—they only exist for a matter of comparison within the region and among regions. As noted above, these regional analytical entities probably do not correspond to actual sociopolitical entities. Since the Central Pacific and Central Highlands regions are so close to each other, and their trajectories are so similar, it seems reasonable to ask how politically integrated they were during pre-Columbian times. More specifically: How many chiefdoms emerged in these two regions? How large were the territories they integrated? Did any of them integrate villages and hamlets located in both regions? A way to study these kinds of questions is by reconstructing the community structure of these two regions, as was done for the San Ramón region.

There is no information about the sociopolitical panorama for the Central Pacific region before 300 B.C.; full-coverage survey in the area would make it possible to understand the settlement pattern and population size during the period 1000-300 B.C. The nature of these settlements—dispersed permanent houses indicating sedentary families living far apart or temporary huts indicating a mobile to semi-mobile population—and their synchronic variability or diversity is still an open question. Long-term research focussed on this period is required in order to advance our understanding about the social structure of these early societies.

For later periods little information about settlement structure and community composition from the Central Pacific region is currently available. When settlements have been

found, the accounts provided rarely offer descriptions beyond the term “site”; in addition, when some work has been carried out at the settlement level the focus has often been on the exposure of monumental architecture and the building of relative chronologies. Systematic regional surveys that allow the characterization of population density and settlement extension and distribution, for each pre-Columbian phase, are much needed in these two regions. This kind of data is an unavoidable requirement for obtaining a better understanding of the settlement structure, nature of communities, and sociopolitical scale in this region. This will also allow a better understanding of the variability and change of these variables throughout the pre-Columbian period.

Finally, the comparison of these variables for the Central Pacific region with similar data coming from the Central Highlands region will show whether the societies in these two regions were at some point in the past integrated into a single political entity, or if instead the leaders in the Central Pacific region were just intensively “emulating” the elite of the Central Highlands.

7.3.4 The Central Guanacaste Region

The past in the Central Guanacaste region is, in general, unique when compared with other regions: there was only one major sociopolitical shift in its pre-Columbian trajectory, when household autonomy was lost—at least partially—because of the emergence of autonomous villages in the region.

Even though it was possible to put together a broad outline of the sociopolitical trajectory of Central Guanacaste, issues such as when and how population became sedentary,

scale and composition of houses and communities in the region and changes in regional population are still to a large extent open question. Thus, once again, research at the settlement and household level is required if we want to understand changes in household and community structure. In addition, regional surveys designed to collect information about changes in demography and settlement pattern are required, this in order to have a regional panorama, as representative as possible, from which it will be possible to select settlements and houses for further investigation.

In any case, we would expect that future research in the region will find that mostly internal factors were involved in the sociopolitical events occurring in pre-Columbian Central Guanacaste, probably related with environmental circumstances. However, it should be also expected that later on in the sequence external, economic relationships—especially with elites located at the western extreme of the Central region (in San Ramón and the surrounding area)—played a dynamic role in the sociopolitical events, especially impacting the ideological sphere by enhancing the prestige and power of local leaders.

This scenario can be further investigated by studying changes in the consumption practices of people inhabiting the Central Guanacaste region. Given the environmental conditions of that region (2072 mm of annual precipitation, and an annual temperature average of 26° C), There should be at least some preservation of ecofacts and human remains in the region because of slightly high pH levels in the soils. This thesis is confirmed by the fact that pre-Columbian human and plant remains were found (Chávez 1998) in burials excavated in a swampy zone of the Tempisque region. Excavations of residential floors from domestic units will be vital to investigate if effectively there were some households having differential access

to foodstuffs (Costin and Earle 1989; Turkon 2004) when compared with other houses in the same village, and with people living in scattered dwellings before 900 A.D. If human remains are located they can be analyzed for reconstructing the shifts in their diet, a technique already implemented in the north Pacific coast (Norr 1991, 1996).

7.3.5 The Arenal Region

The trajectory of the Arenal region is very unusual, given the fact that it is the only pre-Columbian sequence where a return to an earlier stage was detected. In addition, as also happened in Central Guanacaste, chiefdoms never emerged in the Arenal region. Findings of the present research bring support to the thesis proposed by Sheets (1992) that purely local factors were involved in the relatively unchanging trajectory of the Arenal region. It would be expected that future research in the region will find evidence that indicates great stability in variables such as settlement pattern, population size, and interregional exchange. This stability should also be reflected at the house and village scale in different periods. An egalitarian pattern should be also manifested horizontally, among contemporaneous villages and houses. Future research should also find that changes in the sociopolitical organization, settlement pattern, regional population size and interregional exchange had their origins in causes internal to the region.

BIBLIOGRAPHY

Acuña Coto, Víctor

2000 Cronología y tecnología lítica en el Valle de Turrialba, Costa Rica. *Vínculos* 25: 41-76.

Adams, Robert McC.

1981 *Heartland of Cities: Surveys of Ancient Settlement and Land Use on the Central Floodplain of the Euphrates*. University of Chicago Press, Chicago.

Aguilar Piedra, Carlos H.

1972 *Guayabo de Turrialba; arqueología de un sitio indígena prehispánico*. Editorial Costa Rica. San José, Costa Rica.

1974 Asentamientos indígenas en el área central de Costa Rica. *América Indígena* 34: 311-317.

1975 El Molino: un sitio de la fase Pavas en Cartago. *Vínculos* 1: 18-56.

1976 Relaciones de las culturas precolombinas en el Intermontano Central de Costa Rica. *Vínculos* 2: 75-86.

1978 Contribution to the Study of Cultural Sequences in the Central Area of Costa Rica. In *Cultural Continuity in Mesoamerica*, edited by David L. Browman, pp. 387-411. Mouton, The Hague.

Aguilar, Carlos H., Ana C. Arias, Sergio A. Chávez, Dalia Castillo, Mirna Rojas, Margot Reynoard, and, Luis G. Brenes

1988 El mundo de nuestros aborígenes. In *Historia general de Costa Rica*, Vol. I, edited by Vladimir de la Cruz de Lemos, pp. 181-456. Euroamericana de Ediciones de Costa Rica. San José, Costa Rica.

Ammermant, Albert J, Luigi L. Cavalli-Sforza, and Diane K. Wagener

1976 Toward the Estimation of Population Growth in Old World Prehistory. In *Demographic Anthropology, Quantitative Approaches*, edited by Ezra B. W. Zubrow, pp. 27-61. University of New Mexico, Albuquerque.

Arford, Martin R., and Sally P. Horn
2004 Pollen Evidence of the Earliest Maize Agriculture in Costa Rica. *Journal of Latin American Geography* 3: 108-115.

Arias Quirós, Ana C.
1984 Acerca de la unidad cultural entre la Vertiente Atlántica y el Valle Central de Costa Rica. In *Inter-Regional Ties in Costa Rican Prehistory. Papers presented at a symposium at Carnegie Museum of Natural History, Pittsburgh, April, 1983*, edited by Esther Skirboll and Winifred Creamer, pp. 45-58. BAR International Series 226, Oxford.

Arias, Ana C., and Sergio A. Chávez
1985 Ubicación espacio-temporal de los sitios catalogados y registrados en el Valle Central por el Laboratorio de Arqueología de la Universidad de Costa Rica. Unpublished Licenciatura dissertation. Escuela de Antropología, Universidad de Costa Rica.

Arnold, Jeanne E.
1995 Social Inequality, Marginalization, and Economic Process. In *Foundations of Social Inequality*, edited by T. Douglas Price and Gary M. Feinman, pp. 87-103. Plenum Press, New York.

Artavia Rodríguez, Luis G.
1999 Geología, estratigrafía y geomorfología de una parte de los cantones de San Ramón, Palmares y Naranjo. Unpublished document. Escuela Centroamericana de Geología, Universidad de Costa Rica.

Artieda y Chirino, Diego
1907 [1590] Fragmentos de varios litigios sobre la propiedad de los indios de Tucurrique. In *Colección de documentos para la historia de Costa Rica*, Vol. VII, edited by León Fernández Bonilla, pp. 346-406. Impr. Viuda de L. Tasso, Barcelona.

Baker, Paul T., and William T. Sanders
1972 Demographic Studies in Anthropology. *Annual Review of Anthropology* 1: 151-178.

Baldi Salas, Norberto
2001 Black Creek (Cat U.C.R. N° 467): primeras interpretaciones arqueológicas de un modo de vida costero en el Caribe Sur de Costa Rica. Unpublished Licenciatura dissertation. Escuela de Antropología, Universidad de Costa Rica.

Bastian, Adolf
1883 *Zur naturwissenschaftlichen behandlungsweise der psychologie durch und für die völkerkunde*. Weidmann, Berlin.

Baudez, Claude F.
1967 *Recherches Archéologiques dans la Vallée du Tempisque, Guanacaste, Costa Rica*. Travaux et Mémoires de l'Institut des Hautes Etudes de l'Amérique Latine 18. Universite de Paris, Paris.
1970 *Central America*. Barrie & Jenkins, London.

Bergoeing, Jean P.
1981 Fotointerpretación geomorfológica del sector occidental del Valle Central de Costa Rica. (Basado en una imagen del satélite Landsat del 23 de enero de 1979). *Revista Geográfica* 94: 155-160.
1982 *Geomorfología de algunos sectores de Costa Rica, Basada en la fotointerpretación de imágenes del satellite Landsat, en la banda espectral MSS 7*. Publicaciones geográficas del informe semestral julio-diciembre 1982, suplemento del volúmen 28. Instituto Geográfico Nacional. San José, Costa Rica.
2007 *Geomorfología de Costa Rica*. 2nd ed. Librería Francesa. San José, Costa Rica

Bergoeing, Jean P., and Enrique Malavassi Vargas
1982 *Geomorfología del Valle Central de Costa Rica. (Explicación de la carta geomorfológica 1:50.000)*. Convenio Universidad de Costa Rica, Departamento de Geografía-Ministerio de Obras Públicas y Transportes, Instituto Geográfico Nacional. San José, Costa Rica.

Blanco, Aida M., and Silvia Salgado
1980 Rescate arqueológico del sitio 26-CN-Barrial de Heredia. In *V° Centenario de Gonzalo Fernández de Oviedo: memoria del congreso sobre el mundo centroamericano de su tiempo*, edited by Gabriel Ureña Morales, pp. 133-138. Editorial Texto. San José, Costa Rica.

Blanton, Richard E.
2004 Settlement Pattern and Population Change in Mesoamerican and Mediterranean Civilization: A Comparative Perspective. In *Side-by-Side Survey: Comparative Regional Studies in the Mediterranean World*, edited by Susan E. Alcock and John F. Cherry, pp. 206-240. Oxbow Books, Oxford.

Blanton, Richard E., and Gary M. Feinman

1984 The Mesoamerican World System. *American Anthropologist* 86: 673-682.

Blomster, Jeffrey P., Hector Neff, and Michael D. Glanscock
2005 Olmec Pottery Production and Export in Ancient Mexico Determined through Elemental Analysis. *Science* 307: 1068-1072.

Bradley, John E.
1994 Tronadora Vieja: An Archaic and Early Formative Site in the Arenal Region. In *Archaeology, Volcanism, and Remote Sensing in the Arenal Region, Costa Rica*, edited by Payson D. Sheets and Brian R. McKee, pp. 73-86. University of Texas Press, Austin.

Bradley, John E., John W. Hoopes, Payson D. Sheets
1984 Lake Site Testing Program. *Vínculos* 10: 75-92.

Braswell, Geoffrey E., Silvia Salgado González, Laraine A. Fletcher, and Michael D. Glascock
2002 La antigua Nicaragua. La periferia sudeste de Mesoamerica y la región maya: interacción interregional (1-1522 d.C.). *Mayab* 15: 19-40.

Caldwell, Joseph R.
1964 Interaction spheres in prehistory. In *Hopewellian Studies*, edited by Joseph R. Caldwell and Robert L. Hall, pp. 133-143. Scientific Papers 12. Illinois State Museum, Springfield.

Cambronero Castro, Juven (editor)
2001 *San Ramón: su historia.* Impresión Gráfica del Este. Alajuela, Costa Rica.

Carmack, Robert M., and Silvia Salgado
2006 A World-Systems Perspective on the Archaeology and Ethnohistory of the Mesoamerican/Lower Central American Border. *Ancient Mesoamerica* 17: 219–229.

Carneiro, Robert L.
1960 Slash-and-Burn Agriculture: A Closer Look at Its Implications for Settlement Patterns. In *Men and Cultures; Selected Papers of the Fifth International Congress of Anthropological and Ethnological Sciences*, edited by Anthony F.C. Wallace, pp. 229-234. University of Pennsylvania Press, Philadelphia.
1961 Slash-and-Burn Cultivation among the Kuikuru and Its Implications for Cultural Development in the Amazon Basin. In *The Evolution of Horticultural Systems in Native South America: Causes and Consequences; a symposium*, edited by Johannes Wilbert, pp. 47-67. Sociedad de Ciencias Naturales La Salle, Caracas.

1967 On the Relationship between Size of Population and Complexity of Social Organization. *Southwestern Journal of Anthropology* 23: 234-243.

1981 The Chiefdom: Precursor of the State. In *The Transition to Statehood in the New World*, edited by Grant D. Jones and Robert R. Kautz, pp. 37-79. Cambridge University Press, Cambridge.

Castro Sánchez, Silvia

1994 Cambios culturales en San Ramón: transformaciones en la sociedad ramonense de la segunda mitad del siglo XX. In *Antología de Historia de San Ramón: 150 Aniversario (1844-1994)*, edited by José Angel Vargas Vargas, pp. 45-61. Editorial Guayacán. San José, Costa Rica.

Chamberlain, Andrew

2006 *Demography in Archaeology*. Cambridge University Press, Chambridge.

Chávez Chávez, Sergio A.

1991a Informe final. Proyecto: Arqueología de la zona de San Ramón. Unpublished document. Escuela de Antropología, Universidad de Costa Rica.

1991b *La arqueología y los orígenes de nuestros antepasados*. Serie Nuestra Historia, Fascículo 2. Editorial de la Universidad Nacional Estatal a Distancia. San José, Costa Rica.

1992 Arqueología de la zona de San Ramón. Segundo informe parcial (segunda etapa). Unpublished document. Escuela de Antropología, Universidad de Costa Rica.

1994a Hacia una Historia Regional de la Zona de San Ramón. In *Antología de Historia de San Ramón: 150 Aniversario (1844-1994)*, edited by José Angel Vargas Vargas, pp. 9-43. Editorial Guayacán. San José, Costa Rica.

1994b Informe final de la segunda etapa del proyecto: Arqueología de la zona de San Ramón. Unpublished document. Escuela de Antropología, Universidad de Costa Rica.

1998 Relación de las poblaciones antiguas con los recursos naturales inmediatos entre 600-1200 d.C. en el Valle del Tempisque, Guanacaste, Costa Rica. *Anales de prehistoria y arqueología* 13-14 (1997-1998): 227-239.

Chávez, Sergio A., and Ana C. Arias

1987 La práctica de la arqueología en el Valle Central de Costa Rica: Comentarios y perspectivas. *Revista de Ciencias Sociales* 37-38: 119-130.

Childe, Vere Gordon

1925 *The Dawn of European Civilization*. K. Paul, Trench, Trubner & Co., London.

1936 *Man Makes Himself*. Franklin Watts, London.

Chisholm, Michael
1970 *Rural Settlement and Land Use*. Aldine, Chicago.

Clark, John. E., and Michael Blake
1994 The Power of Prestige: Competitive Generosity and the Emergence of Rank Societies in Lowland Mesoamerica. In *Factional Competition and Political Development in the New World*, edited by Elizabeth M. Brumfiel and John W. Fox, pp. 17-30. Cambridge University Press, Cambridge.

Clarke, David L.
1977 *Spatial archaeology*. Academic Press, London.

Clement Rachel M., and Sally P. Horn
2001 Pre-Columbian Land-Use History in Costa Rica: A 3000-year Record of Forest Clearance, Agriculture and Fires from Laguna Zoncho. *The Holocene* 11: 419-426.

Coe, Michael D.
1962 Costa Rican Archaeology and Mesoamerica. *Southwestern Journal of Anthropology* 18:170-183.

Coe, Michael D., and Claude F. Baudez
1961 The Zoned Bichrome Period in Northwestern Costa Rica. *American Antiquity* 26: 505-515.

Cooke, Richard
2005 Prehistory of Native Americans on the Central American Land Bridge: Colonization, Dispersal, and Divergence. *Journal of Archaeological Research* 13: 129-187.

Cornejo, Luis E., and Lorena Sanhueza
2003 Coexistencia de Cazadores Recolectores y Horticultores Tempranos en la Cordillera Andina de Chile Central. *Latin American Antiquity* 14: 389-407.

Corrales Ulloa, Francisco
1992 Investigaciones arqueológicas en el Pacífico Central de Costa Rica. *Vínculos* 16: 1-29.
2000 An Evaluation of Long-Term Cultural Change in Southern Central America: The Ceramic Record of the Diquís Archaeological Subregion, Costa Rica. Unpublished Ph.D. dissertation. Department of Anthropology, University of Kansas, Lawrence.

2001 *Los primeros costarricenses.* Museo Nacional de Costa Rica. San José, Costa Rica.

Corrales, Francisco, and Ifigenia Quintanilla
1992 El Pacífico Central de Costa Rica y el intercambio regional. *Vínculos* 16: 111-126.
1996 The Archaeology of the Central Pacific Coast of Costa Rica. In *Paths to Central American Prehistory*, edited by Frederick W. Lange, pp. 93-117. University Press of Colorado, Boulder.

Costin, Cathy and Timothy K. Earle.
1989 Status distinction and legitimation of power as reflected in changing patterns of consumption in late prehispanic Peru. *American Antiquity* 54: 691-714.

Creamer, Winifred
1982 Sistemas de intercambio en el Golfo de Nicoya, Costa Rica, 1200-1550 d.C. *Vínculos* 8: 13-38.
1983 Production and Exchange on Two Islands in the Gulf of Nicoya, Costa Rica, A.D. 1200-1550. Unpublished Ph.D. dissertation, Department of Anthropology, Tulane University.
1992 Regional Exchange along the Pacific Coast of Costa Rica during the Late Polychrome Period, A.D. 1200-1550. *Journal of Field Archaeology* 19: 1-16.

Dávila Martín, Juan
1883 [1566] Relación circunstanciada de la provincial de Costa-Rica. In *Colección de documentos para la historia de Costa Rica*, Vol. III, edited by León Fernández Bonilla, pp. 33-44. Imprenta Nacional. San José, Costa Rica.

Denyer, Percy, and Guillermo E. Alvarado
2007 *Mapa geológico de Costa Rica*. Librería Francesa. San José, Costa Rica.

Diehl, Richard A.
2005 Patterns of Cultural Primacy. *Science* 307: 1055-1056.

Diehl, Richard A., and Michael D. Coe
1995 Olmec Archaeology. In *The Olmec World: Ritual and Rulership*, edited by Michael D. Coe, pp. 123-125. Princeton University Art Museum, Princeton.

Drennan, Robert D.
1987 Regional Demography in Chiefdoms. In *Chiefdoms in the Americas*, edited by Robert D. Drennan and Carlos A. Uribe, pp. 307-324. University Press of America, Lanham.

1988 Household Location and Compact versus Dispersed Settlement in Prehispanic Mesoamerica. In *Household and Community in the Mesoamerican Past: Case Studies in the Maya Area and Oaxaca*, edited by Richard R. Wilk and Wendy Ashmore, pp. 273-393. University of New Mexico Press, Albuquerque.

1991 Pre-Hispanic Chiefdom Trajectories in Mesoamerica, Central America, and Northern South America. In *Chiefdoms: Power, Economy, and Ideology*, edited by Timothy Earle, pp. 263-287. Cambridge University Press, Cambridge.

1995 Chiefdoms in Northern South America. *Journal of World Prehistory* 9: 301-340.

1996a Betwixt and Between in the Intermediate Area. *Journal of Archaeological Research* 4: 95-132.

1996b One for All and All for One: Accounting for Variability without Losing Sight of Regularities in the Development of Complex Society. In *Emergent Complexity: The Evolution of Intermediate Societies*, edited by Jeanne E. Arnold, pp. 25-34. Archaeological Series 9. International Monographs in Prehistory, Ann Arbor.

2000 Las sociedades prehispánicas del Alto Magdalena. Instituto Colombiano de Antropología e Historia, Bogotá.

Drennan, Robert D. (editor)

2006 *Prehispanic Chiefdoms in the Valle de la Plata, Volume 5. Regional Settlement Patterns*. University of Pittsburgh Memoirs in Latin American Archaeology No. 16. University of Pittsburgh Latin American Archaeology Publications, Pittsburgh.

Drennan, Robert D., and Christian E. Peterson

2004 Comparing Archaeological Settlement Systems with Rank-Size Graphs: A Measure of Shape and Statistical Confidence. *Journal of Archaeological Science* 31: 533-549.

Drennan, Robert D., Teng Mingyu, Christian E. Peterson, Gideon Shelach, Gregory G. Indrisano, Zhu Yanping, Katheryn M. Linduff, Guo Zhizhong, and Manuel Román Lacayo

2003a Methods for Archaeological Settlement Study. In *Regional Archaeology in Eastern Inner Mongolia: A Methodological Exploration*, edited by The Chifeng International Collaborative Archaeological Research Project, pp. 122-151. Science Press, Beijing.

Drennan, Robert D., Christian E. Peterson, Gregory G. Indrisano, Teng Mingyu, Gideon Shelach, Zhu Yanping, Katheryn M. Linduff, and Guo Zhizhong

2003b Approaches to Regional Demographic Reconstruction. In *Regional Archaeology in Eastern Inner Mongolia: A Methodological Exploration*, edited by The Chifeng International Collaborative Archaeological Research Project, 152-165. Science Press, Beijing.

Ducca, Alejandra, Yadira Esquivel, María de los Ángeles Estrada, Paul Fonseca, Guiselle Lutz, Ann Lykens, Vilma Madriz, Ligia Sánchez, and Sonia Silva.
1974 Trabajo sobre el sitio arqueológico de Chaparral, San Ramón. Unpublished document. Escuela de Antropología, Universidad de Costa Rica.

Earle, Timothy K.
1987 Chiefdoms in Archaeological and Ethnohistorical Perspective. *Annual Review of Anthropology* 16: 279-308.
1991 *Chiefdoms: Power, Economy, and Ideology*. Cambridge University Press, Cambridge.
1997 Chapter 6: Chiefly Power Strategies and the Emergence of Complex Political Institutions. In *How Chiefs Come to Power: The Political Economy in Prehistory*, pp. 193-211. Stanford University Press, California.

Echavarría Campos, Trino
1966 *Historia y geografía del cantón de San Ramón*. Imprenta Nacional. San José, Costa Rica.

Ember, Melvin
1963 The Relationship between Economic and Political Development in Nonindustrialized Societies. *Ethnology* 2: 228-248.

Feinman, Gary M.
1991 Demography, Surplus, and Inequality: Early Political Formations in Highland Mesoamerica. In *Chiefdoms: Power, Economy and Ideology*, edited by Timothy K. Earle, pp. 229-262. Cambridge University Press, Cambridge.

Feinman, Gary M., and Jill E. Neitzen
1984 Too Many Types: An Overview of Sedentary Prestate Societies in the Americas. In *Advances in Archaeological Method and Theory*, Vol. 7, edited by Michael B. Schiffer, pp. 39–102. Academic Press, New York.

Fernández Bonilla, León (editor)
1883 *Colección de documentos para la historia de Costa Rica*, Vol. III. Imprenta Nacional. San José, Costa Rica.

Fernández de Oviedo, Gonzalo
1855 [1556] *Historia General y Natural de las Indias, Islas y Tierra-Firme del Mar Océano*, III Part, Book IV. Imprenta de la Real Academia de la Historia, Madrid.

Findlow, Frank J., Michael J. Snarskis, and Phyllis Martin
1979 Un análisis de zonas de explotación relacionadas con algunos sitios prehistóricos de la Vertient Atlántica de Costa Rica. *Vínculos* 5: 53-71.

Fish, Suzanne K., and Stephen A. Kowalewski (editors)
1990 *The Archaeology of Regions: A Case for Full-Coverage Survey*. Smithsonian Institution Press, Washington, D.C.

Fiztgerald Bernal, Carlos
1996 Prestige Goods in the Archaeological Sequences of Costa Rican and Panamanian Chiefdoms. In *Chieftains, Power & Trade: Regional Interaction in the Intermediate Area of the Americas*, edited by Carl H. Langebaek and Felipe Cardenas Arroyo, pp. 47-62. Universidad de los Andes, Bogotá.

Flannery, Kent V.
1973 Archaeology with a Capital "S". In *Research and Theory in Current Archaeology*, edited by Charles L. Redman, pp. 47-53. John Wiley and Sons, New York.
1976a Sampling by Intensive Surface Collection. In *The Early Mesoamerican Village*, edited by Kent V. Flannery, pp. 51-62. Academic Press, New York.
1976b Analysis on the Household Level. In *The Early Mesoamerican Village*, edited by Kent V. Flannery, pp. 13-16. Academic Press, New York.
1982 Review of *In the Land of the Olmec: The Archaeology of San Lorenzo Tenochtitlan, Volume 1; In the Land of the Olmec: The People of the River, Volume 2* by Coe, Michael D. and Richard Diehl. *American Anthropologist* 84: 442-447.

Flannery, Kent V., and Joyce Marcus
2000 Formative Mexican Chiefdoms and the Myth of the "Mother Culture". *Journal of Anthropological Archaeology* 19: 1-37.

Flannery, Kent V., Andrew K. Balkansky, Gary M. Feinman, David C. Grove, Joyce Marcus, Elsa M. Redmond, Robert G. Reynolds, Robert J. Sharer, Charles S. Spencer, and Jason Yaeger
2005 Implications of New Petrographic Analysis for the Olmec “Mother Culture” Model. *Proceedings to the National Academy of Sciences of the United States of America* 102: 11219-11223.

Fonseca Zamora, Óscar M.
1992 *Historia antigua de Costa Rica: Surgimiento y caracterización de la primera civilización costarricense*. Editorial de la Universidad de Costa Rica. San José, Costa Rica.

1994 El concepto de área de tradición chibchoide y su pertinencia para entender la Gran Nicoya. *Vínculos* 18: 209-228.
1997 La confirmación de los espacios históricos, el caso de América Central y el noroccidente colombiano. In *III Simposio Panamericano de Historia*, pp. 21–357. Instituto Panamericano de Geografía e Historia, México.
1998 El espacio histórico de los amerindios de filiación chibcha: El Área Histórica Chibchoide. In *Memorias del Primer congreso científico sobre pueblos indígenas de Costa Rica y sus fronteras*, edited by Ramiro Barrantes, María Eugenia Bozzoli, and Patricia Gudiño, pp. 36–60. Editorial de la Universidad Nacional de Educación a Distancia. San José, Costa Rica.

Fonseca, Óscar M., and Richard Cooke
1993 Historia antigua del sur de la América Central: una contribución al estudio de la Región Histórica Chibcha. In *Historia antigua de la América Central: del Poblamiento a la Conquista*, edited by Robert Carmack, pp. 217-281. Editorial Siruela, Madrid.

Fonseca, Óscar M., and Luis Hurtado de Mendoza
1984 Algunos resultados de las investigaciones en la Región de Guayabo de Turrialba. *Revista de Ciencias Sociales* (Edición Especial) 1: 37-51.

Fonseca, Óscar M., and James B. Richardson III
1978 South American and Maya Cultural Contacts at the Las Huacas Site, Costa Rica. *Annals of the Carnegie Museum* 47:299-317.

García, Marco V., Mario A. Boza, and Ricardo Zúñiga.
1994 *The Tropical Cloud Forest*. Fundación Neotrópica/Editorial Heliconia. San José, Costa Rica.

Gilman, Antonio
1976 Bronze Age Dynamics in Southeast Spain. *Dialectical Anthropology* 1: 307-319.
1981 The Development of Social Stratification in Bronze Age Europe. *Current Anthropology* 22: 1-8.
1991 Trajectories towards Social Complexity in the Later Prehistory of the Mediterranean. In *Chiefdoms: Power, Economy, and Ideology*, edited by Timothy Earle, pp. 263-287. Cambridge University Press, Cambridge.
2001 Assessing Political Development in Copper and Bronze Age Southeast Spain. In *From Leaders to Rulers*, edited by Jonathan Hass, pp. 59-81. Kluwer Academic/Plenum, New York.

Goldstein, Paul S.

2000 Exotic Goods and Everyday Chiefs: Long-Distance Exchange and Indigenous Sociopolitical Development in the South Central Andes. *Latin American Antiquity* 11: 335-361.

Guerrero Miranda, Juan V.
1980 La Fábrica: Un sitio con rasgos arquitectónicos de la fase Curridabat. Unpublished document. Museo Nacional de Costa Rica. San José, Costa Rica.
1985 La prehistoria del cantón de Grecia. *Comunidades* 2: 33-35.

Guerrero, Juan V., and Felipe Solís
1997 *Los pueblos antiguos de la zona Cañas- Liberia*. Museo Nacional de Costa Rica. San José, Costa Rica.

Gutierrez González, Maritza
1986 Interpretaciones preliminares de los rasgos "tumbas de botella" del sitio CENADA: Intermontano Central. *Journal of the Steward Anthropological Society* 14: 255-268.

Haggett, Peter
1965 *Locational Analysis in Human Geography*. Edward Arnold, London.

Hall, Thomas D., and Christopher Chase-Dunn
1993 The World-Systems Perspective and Archaeology: Forward into the Past. *Journal of Archaeological Research* 1: 121-143.

Hass, Jonathan
2001 Warfare and the Evolution of Culture. In *The Archaeology at the Millennium: A Sourcebook*, edited by Gary M. Feinman and T. Douglas Price, pp. 329-350. Kluwer Academic/Plenum Publishers, New York.

Hassan, Fekri A.
1981 *Demographic Archaeology*. Academic Press, New York.

Healy, Paul
1992 Ancient Honduras: Power, Wealth, and Rank in Early Chiefdoms. In *Wealth and Hierarchy in the Intermediate Area*, edited by Frederick W. Lange, pp. 85-108. Dumbarton Oaks Research Library and Collection, Washington, D.C.

Helms, Mary W.

1979 *Ancient Panama: Chiefs in Search of Power*. University of Texas Press, Austin.

Hill, James N.
1970 *Broken K Pueblo: Prehistoric Social Organization in the American Southwest.* Anthropological papers of the University of Arizona, No. 18. University of Arizona Press, Tucson.

Hirth, Kenneth G.
1992 The Household as an Analytical Unit: Problems in Method and Theory. In *Prehispanic Domestic Units in Western Mesoamerica: Studies of the Household, Compound, and Residence*, edited by Robert S. Santley and Kenneth G. Hirth, pp. 21-36. CRC Press, Boca Ratón.

Hodder, Ian
1982 *Symbols in Action: Ethnoarchaeological Studies of Material Culture*. Cambridge University Press, Cambridge.

Hodder, Ian, and Scott Hudson
2004 *Reading the Past: Current Approaches to Interpretation in Archaeology*. 3rd ed. Cambridge University Press, Cambridge.

Hodder, Ian, and Clive Orton
1976 *Spatial Analysis in Archaeology*. Cambridge University Press, Cambridge.

Holdridge, Leslie R.
1964 *Life Zone Ecology*. Tropical Science Center. San Jose, Costa Rica.

Hoopes, John W.
1987 Early Ceramics and the Origins of Village Life in Lower Central America. Unpublished Ph.D. dissertation. Department of Anthropology, Harvard University.
1992 Early Formative Cultures in the Intermediate Area: A Background to the Emergence of Social Complexity. In *Wealth and Hierarchy in the Intermediate Area*, edited by Frederick W. Lange, pp. 43-83. Dumbarton Oaks Research Library and Collection, Washington, D.C.
1994 Ceramic Analysis and Culture History in the Arenal Region. In *Archaeology, Volcanism, and Remote Sensing in the Arenal Region, Costa Rica*, edited by Payson D. Sheets and Brian R. McKee, pp. 158-210. University of Texas Press, Austin.
2005 The Emergence of Social Complexity in the Chibchan World of Southern Central America and Northern Colombia, AD 300-600. *Journal of Archaeological Research* 13: 1-47.

Hoopes, John W., and Óscar M. Fonseca
2003 Goldwork and Chibchan Identity: Endogenous Change and Diffuse Unity in the Isthmo-Colombian Area. In *Gold and Power in Ancient Costa Rica, Panama, and Colombia*, edited by Jeffrey Quilter and John W. Hoopes, pp. 49-89. Dumbarton Oaks Research Library and Collection, Washington, D.C.

Horn, Sally P., and Lisa M. Kennedy
2001 Pollen Evidence of Maize Cultivation 2700 B.P. at La Selva Biological Station, Costa Rica. *Biotropica* 33: 191-196.

Ibarra Rojas, Eugenia
1990 *Las sociedades cacicales de Costa Rica (siglo XVI)*. Editorial de la Universidad de Costa Rica. San José, Costa Rica.

Johnson, Gregory A.
1977 Aspects of Regional Analysis in Archaeology. *Annual Review of Anthropology* 6: 479-508.
1980 Rank-Size Convexity and System Integration: A View from Archaeology. *Economic Geography* 56: 234-247.
1981 Monitoring Complex System Integration and Boundary Phenomena with Settlement Size Data. In *Archaeological Approaches to the Study of Complexity*, edited by Sander Ernst van der Leeuw, pp. 144-188. Universiteit van Amsterdam, Amsterdam.

Joyce, Rosemary A.
1996 Social Dynamics of exchange: Changing patterns in the Honduran Archaeological Record. In *Chieftains, Power and Trade: Regional Interaction in the Intermediate Area of the Americas*, edited by Carl H. Langebaek and Felipe Cárdenas, pp. 31-45. Universidad de los Andes. Bogotá.

Kepecs, Susan, and Philip Kohl
2003 Conceptualizing Macroregional Interaction: World-Systems Theory and the Archaeological Record. In The Postclassic Mesoamerican World, edited by Michael E. Smith and Frances F. Berdan. The University of Utah Press, Salt Lake City.

Kertzer, David I., and Tom Fricke (editors)
1997 *Anthropological Demography: toward a new synthesis*. University of Chicago Press, Chicago.

Kolb, Charles C.
1985 Demographic Estimates in Archaeology: Contributions from Ethnoarchaeology on Mesoamerican Peasants. *Current Anthropology* 26: 581-591.

Kipp, Rita S., and Edward M. Schortman
1989 The Political Impact of Trade in Chiefdoms. *American Anthropologist* 91: 370-325.

Kirch, Patrick V.
1984 *The Evolution of the Polynesian Chiefdoms*. Cambridge University Press. Cambridge.

Kirkby, Anne V.
1973 *The use of land and water resources in the past and present Valley of Oaxaca, Mexico*. Memoirs of the Museum of Anthropology, University of Michigan, no. 5. University of Michigan Museum of Anthropology Publications, Ann Arbor.

Kowalewski, Stephen A., Gary Feinman, Laura Finsten, Robert E. Blanton, and Linda M. Nicholas
1989 *Monte Alban's Hinterland. Part 2. Prehispanic Settlement Patterns in Tlacolula, Etla and Ocotlan, the Valley of Oaxaca, Mexico.* 2 Vol. Memoirs of the Museum of Anthropology, University of Michigan, no. 23. University of Michigan Museum of Anthropology Publications, Ann Arbor.

Lane, Chad S, Sally P. Horn, and Claudia I. Mora
2004 Stable Carbon Isotope Ratios in Lake and Swamp Sediments as a Proxy for Prehistoric Forest Clearance and Crop Cultivation in the Neotropics. *Journal of Paleolimnology* 32: 375–381.

Lange, Frederick W.
1971 *Culture History of the Sapoa River Valley, Costa Rica*. Occasional Papers in Anthropology No. 4, Logan Museum of Anthropology. Beloit College, Wisconsin.
1972 *The Archaeology of the San Dimas Valley, Costa Rica*. Museum of Anthropology Miscellaneous Series No. 30. University of Northern Colorado, Greeley.
1975 Excavaciones de salvamento en un cementerio del período Bicromo en Zonas, Guanacaste, Costa Rica. *Vínculos* 1: 92-98.
1978 Coastal Settlement in Northwestern Costa Rica. In *Prehistoric Coastal Adaptations: The Economy and Ecology of Maritime Middle America*, edited by Barbara L. Stark and Barbara Voorhies, pp. 101-119. Academic Press, New York.

1984a The Greater Nicoya Archaeological Subarea. In *The Archaeology of Lower Central America*, edited by Frederick W. Lange and Doris Z. Stone, pp. 165-194. University of New Mexico Press, Albuquerque.

1984b Elite Participation in Precolumbian Ceramic Transfer in Costa Rica. In *Inter-Regional Ties in Costa Rican Prehistory. Papers presented at a symposium at Carnegie Museum of Natural History, Pittsburgh, April, 1983*, edited by Esther Skirboll and Winifred Creamer, pp. 143-178. BAR International Series 226, Oxford.

1992 Elite Personages and Site Hierarchies in Greater Nicoya. In *Wealth and Hierarchy in the Intermediate Area*, edited by Frederick W. Lange, pp. 109-139. Dumbarton Oaks Research Library and Collection, Washington, D.C.

2006 *Before Guanacaste: An Archaeologist Looks at the First 10,000 Years*. ASELEX-Comunicación Corporativa. San José, Costa Rica

Lange, Frederick W. (editor)

1993 *Precolumbian Jade: New Geological and Cultural Interpretations*, University of Utah Press, Salk Lake City.

Lange, Frederick W., and Thomas A. Murray

1972 The Archaeology of the San Dimas Valley, Costa Rica. *Katunob* 7(4): 50-90.

Lange, Frederick W., and Kristin. K. Scheidenhelm

1972 The salvage archaeology of a Zoned Bichrome cemetery, Costa Rica. *American Antiquity* 37: 240-245.

Lange, Frederick W., Payson D. Sheets, Anibal Martinez, and Suzanne Abel-Vidor

1992 *The Archaeology of Pacific Nicaragua*. University of New Mexico Press, Albuquerque.

Lange, Frederick W., Erin L. Sears, Ronald L. Bishop, and Silvia Salgado González

2003 Local Production, Non-local Production, and Distribution: Usulutan and Usulutan-like Negative Painted Ceramics in Nicaragua. In *Patterns and Process. A Festschrift in Honor of Dr. Edward V. Sayre*, edited by Lambertus van Zelts, pp. 157–171. Smithsonian Center for Materials Research and Education, Washington, D.C.

Langebaek, Carl H.

1991 Highland Center and Foothill Periphery in 16th-Century Eastern Colombia. *Research in Economic Anthropology* 13: 325-339.

1992 *Noticias de caciques muy mayores: origen y desarrollo de sociedades complejas en el nororiente de Colombia y norte de Venezuela*. Universidad de los Andes. Bogotá, Colombia.

1995 *Regional Archaeology in the Muisca Territory: A Study of the Fúquene and Susa Valleys*. University of Pittsburgh Memoirs in Latin American Archaeology No. 16. University of Pittsburgh Latin American Archaeology Publications, Pittsburgh.

LeBlanc, Steven
1971 An Addition to Naroll's Suggested Floor Area and Settlement Population Relationship. *American Antiquity* 36: 210-211.

León, Magdalena, and Silvia Salgado
2002 Los desarrollos socials de la fase Pavas (300 a.C.-300 d.C.) en el sector occidental del Valle Central. *Vínculos* 27: 2-18.

Linares, Olga F.
1975 Central America. In Current Research, edited by Mary Elizabeth King. *American Antiquity* 40: 239-240.

Lines, Jorge A., and Carlos Meléndez
1961 *IV centenario de la entrada de Cavallón a Costa Rica: 1561-1961*. Imprenta Nacional. San José, Costa Rica.

Longacre, William A.
1976 Population Dynamics at the Grasshopper Pueblo, Arizona. In *Demographic Anthropology, Quantitative Approaches*, edited by Ezra B. W. Zubrow, pp. 169-184. University of New Mexico, Albuquerque.

Lothrop, Samuel K.
1966 Archaeology of Lower Central America. In *Archaeological Frontiers and External Connections*, edited by Gordon F. Ekholm, and Gordon R. Willey, pp. 180-208. Handbook of Middle American Indians, Vol. 4., Robert Wauchope, general editor. University of Texas Press, Austin.

Mahaney, Nancy, Meredith H. Matthews, and Aida Blanco
1994 Macrobotanical Remains of the Proyecto Prehistórico Arenal. In *Archaeology, Volcanism, and Remote Sensing in the Arenal Region, Costa Rica*, edited by Payson D. Sheets and Brian R. McKee, pp. 303-311. University of Texas Press, Austin.

Matthews, Meredith H.

1984 Results of Macrobotanical Analysis for the Proyecto Prehistórico Arenal: Preliminary Evidence of Resource Use and Subsistence Strategies. *Vínculos* 10: 193-205.

Meggers, Betty J., and Clifford Evans
1957 *Archaeological Investigations at the Mouth of the Amazon*. Bureau of American Ethnology, Bulletin 167. Smithsonian Institution, Washington, D.C.

Mena Arguedas, Max
2008 Clima de Costa Rica. Electronic document, http://www.imn.ac.cr/educacion/CLIMA%20DE%20COSTA%20RICA.html, accessed June 4, 2008.

Moncada Gamboa, Arturo
1917 *Historia de San Ramón*. Tipología de San José. San José, Costa Rica.

Morgan, Lewis H.
1877 *Ancient society; or, Researches in the lines of human progress from savagery, through barbarism to civilization*. Macmillan, London.

Murdock, George P.
1949 *Social Structure*. MacMillan, New York.

Murdock, George P., and Suzanne F. Wilson
1972 Settlement Patterns and Community Organization: Cross-Cultural Codes 3. *Ethnology* 11: 254–95.

Naroll, Raoul
1956 A Preliminary Index of Social Development. *American Anthropologist* 58: 687-715.
1962 Floor Area and Settlement Population. *American Antiquity* 27: 587-589.

Navarrete, Agustín
1899 Las necrópolis de San Juan. In *Informe del segundo semestre y fin de año económico 1898 a 1899*. Juan Fernández Ferraz, pp. 29-51. Museo Nacional de Costa Rica. Tipología Nacional. San José, Costa Rica.

Neff, Hector.
2006 The Olmec and the Origins of Mesoamerican Civilisation. *Antiquity* 80: 714-716.

Netting, Robert McC.
1990 Population, Permanent Agriculture, and Politics: Unpacking the Evolutionary Portmanteau. In *The Evolution of Political Systems: Sociopolitics in Small-scale Sedentary Societies*, edited by Steadman Upham, pp. 21-61. Cambridge University Press, Cambridge.

Niemel, Karen
2005 Interregional Interaction and the Prehistoric Social Development of the Rivas Region, Pacific Nicaragua. *Journal of World Anthropology* 2: 272-287.

Norr, Lynette
1991 Nutritional Consequences of Prehistoric Subsistence Strategies in Lower Central America. Unpublished Ph.D. dissertation. Department of Anthropology, University of Illinois at Urbana-Champaign.
1996 Prehistoric Coastal Subsistence in Northwestern Costa Rica: Geographical Diversity and Chronological Trends. In *Paths to Central American Prehistory*, edited by Frederick W. Lange, pp. 253-269. University Press of Colorado, Boulder.

Novoa, Virginia, and A. Cristina Hernández
2004 Análisis del contexto arqueológico del sitio El Pital (A-150 EP), fase Pavas (300 a.C.-300 d.C.), cuenca media del río Virilla, Alajuela, Costa Rica. Unpublished Licenciatura dissertation. Escuela de Antropología, Universidad de Costa Rica.

Norweb, Albert H.
1961 The Archaeology of the Greater Nicoya Subarea. Unpublished document. Peabody Museum of Archaeology and Ethnology, Harvard University.

O'Brien, Michael J., and R. Lee Lyman (editors)
2003 *Style, Function, Transmission: Evolutionary Archaeological Perspectives*. University of Utah Press, Salt Lake City.

Observatorio del desarrollo/Universidad de Costa Rica
2008 Módulo de observación cantonal. Electronic document, http://www.tdc.odd.ucr.ac.cr/censos.php?var1=TDC001567, accessed October 15, 2008.

Odio Orozco, Eduardo
1992 La pochota: un complejo cerámico temprano en las tierras bajas del Guanacaste, Costa Rica. *Vínculos* 1-16.

Olsson, Gunnar
1965 *Distance and Human Interaction: A Review and Bibliography*. Regional Science Research Institute, Pennsylvania.

Paine, Richard R. (editor)
1997 *Integrating Archaeological Demography: Multidisciplinary Approaches to Prehistoric Population*. Center for Archaeological Investigations, Occasional Paper No. 24. Southern Illinois University Press, Carbondale.

Paniagua Alvarado, Rafael L.
1943 *Apuntes históricos y crónicas de la ciudad de San Ramón en su centernario*. La Tribuna. San José, Costa Rica.

Parkinson, William A.
2006 *The Social Organization of Early Copper Age Tribes on the Great Hungarian Plain*. BAR International Series 1573, Oxford.

Peterson, Christian E.
2006 "Crafting" Hongshan Communities? Household Archaeology in the Chifeng Region of Eastern Inner Mongolia, PRC. Unpublished Ph.D. dissertation. Department of Anthropology, University of Pittsburgh.

Peterson, Christian E., and Robert D. Drennan
2005 Communities, Settlements, Sites, and Surveys: Regional-Scale Analysis of Prehistoric Human Interaction. *American Antiquity* 70: 5-30. Peytrequín Gómez, Jeffrey, and Mónica Aguilar Bonilla
2007 Los indicadores arqueológicos de un modo de vida cacical en el sitio Agua Caliente. *Vínculos* 30: 57-81.

Pineda González, Miriam, and Silvia Castro Sánchez
1986 *Colonización, poblamiento y economía: San Ramón 1842-1900*. Avance de Investigación Número 15. Centro de Investigaciones Históricas, Universidad de Costa Rica. San José, Costa Rica.

Plog, Fred
1975 Demographic Studies in Southwestern Prehistory. In *Population Studies in Archaeology and Biological Anthropology*, edited by Alan C. Swedlund, pp. 94-103. Memoir No. 30. Society for American Archaeology, Washington, D.C.

Plog, Stephen
1976 Measurement of Prehistoric Interaction between Communities. In *The Early Mesoamerican Village*, edited by Kent V. Flannery, pp. 255-372. Academic Press, New York.

Politis, Gustavo G.
2007 *Kukak: Ethnoarchaeology of an Amazonian People*. Left Coast Press. Walnut Creek, California.

Politis, Gustavo G., Gustavo A. Martínez, and Mariano Bonomo
2001 Alfareria Temprana en Sitios de Cazadores-Recolectores de la Region pampeana. *Latin American Antiquity* 12: 167-181.

Quilter, Jeffrey, and John W. Hoopes (editors)
2003 *Gold and Power in Ancient Costa Rica, Panama, and Colombia*. Dumbarton Oaks Research Library and Collection, Washington, D.C.

Renfrew, A. Colin
1975 Trade as Action at a Distance: Questions of Integration and Communication. In *Ancient Civilization and Trade*, edited by Jeremy A. Sabloff and C.C. Lamberg-Karlovsky, pp. 3-59. University of New Mexico Press, Albuquerque.
1986 Introduction. In *Peer Polity Interaction and Socio-Political Change*, edited by A. Colin Renfrew and John F. Cherry, pp. 1-18. Cambridge University Press, Cambridge.
1994 The Archaeology of Religion. In *The Ancient Mind*, edited by Colin Renfrew and Ezra B. W. Zubrow, pp. 47-54. Cambridge University Press, Cambridge.

Rojas Hernández, A. Patricia
1995 Sitio Volio Cat. UCR Nº 179: Una discusión acerca de la conservación de la evidencia arqueológica en el campo y en el laboratorio. Unpublished Licenciatura dissertation. Escuela de Antropología, Universidad de Costa Rica.
2000 Sitio Volio Cat. UCR N° 179: Informe Final Temporada enero-febrero 2000. Unpublished document. Escuela de Antropología, Universidad de Costa Rica.
2008 Investigaciones arqueológicas en el sitio Volio Cat. UCR 179. *Cuadernos de Antropología* 16: 25-36.

Rojas Garro, Myrna
1998 Borrador de la monografía del sitio CENADA. Unpublished document. Escuela de Antropología e Historia. Museo Nacional de Costa Rica.

Rojas, Myrna, and José C. Bustos
2005 Informe de inspección arqueológica en San Ramón de Alajuela. Unpublished document. Escuela de Antropología e Historia. Museo Nacional de Costa Rica.

Sahlins, Marshall D.
1972 *Stone Age Economics*. Aldine-Atherton, Chicago.

Sanders, William T.
1984 Pre-Industrial Demography and Social Evolution. In *On the Evolution of Complex Societies: Essays in honor of Harry Hoijer 1982*, edited by Timothy K. Earle, pp. 7-39. Undena, Malibu.

Sanders, William T., Robert S. Santley, and Jeffrey Parsons
1979 *The Basin of Mexico. The Ecological Processes in the Evolution of a Civilization*. Academic Press, New York.

Schortman, Edward M., and Patricia A. Urban (editors)
1992 *Resources, Power, and Interregional Interaction*. Plenum Press, New York.

Sheets, Payson D.
1984 Summary and Conclusions. *Vínculos* 10:207-231.
1992 The Pervasive Pejorative in Intermediate Area Studies. In *Wealth and Hierarchy in the Intermediate Area*, edited by Frederick W. Lange, pp. 15-41. Dumbarton Oaks Research Library and Collection, Washington, D.C.
1994 Summary and Conclusions. In *Archaeology, Volcanism, and Remote Sensing in the Arenal Region, Costa Rica*, edited by Payson D. Sheets and Brian R. McKee, pp. 312-326. University of Texas Press, Austin.

Sheets, Payson D., and Brian R. McKee
1994 *Archaeology, Volcanism, and Remote Sensing in the Arenal Region, Costa Rica*. University of Texas Press, Austin.

Sheets, Payson D., John Hoppes, William Melson, Brian McKee, Tom Sever, Marilynn Mueller, Mark Chenault, and John Bradley
1991 Prehistory and Volcanism in the Arenal Area, Costa Rica. *Journal of Field Archaeology* 18: 445-465.

Shennan, Stephen J.
1982 Ideology, Change and the European Early Bronze Age. In *Symbolic and Structural Archaeology*, edited by Ian Hodder, pp. 155-161. Cambridge University Press, Cambridge.
2002 *Genes, Memes and Human History: Darwinian Archaeology and Cultural Evolution*. Thames and Hudson, London.

Snarskis, Michael J.
1978 The Archaeology of the Central Atlantic Watershed of Costa Rica. Unpublished Ph.D. dissertation. Department of Anthropology, Columbia University.
1981a Archaeology of Costa Rica. In *Between Continents/Between Seas: Precolumbian Art of Costa Rica*, edited by Elizabeth P. Benson, pp. 15-84. Harry N. Abrams, New York.
1981b Catalogue. In *Between Continents/Between Seas: Precolumbian Art of Costa Rica*, edited by Elizabeth P. Benson, pp. 15-84. Harry N. Abrams, New York.
1982 *La cerámica precolombina en Costa Rica*. Instituto Nacional de Seguros. San José, Costa Rica.
1984a Central America: The Lower Caribbean. In *The Archaeology of Lower Central America*, edited by Frederick W. Lange and Doris Z. Stone, pp. 195-232. University of New Mexico Press, Albuquerque.
1984b Patterns of Interregional Contacts as Seen From the Central Highlands-Atlantic Watershed of Costa Rica. In *Inter-Regional Ties in Costa Rican Prehistory. Papers presented at a symposium at Carnegie Museum of Natural History, Pittsburgh, April, 1983*, edited by Esther Skirboll and Winifred Creamer, pp. 29-58. BAR International Series 226, Oxford.
1984c Prehistory Microsettlement Patterns in the Central Highlands-Atlantic Watershed of Costa Rica. In *Recent Developments in Isthmian Archaeology: Advances in the Prehistory of Lower Central America*, edited by Frederick W. Lange, pp. 153-179. BAR International Series 212, Oxford.
1986 Un modelo de la evolución cultural en Costa Rica (500 a.C.-1500 d.C.). In *Memorias del Primer Simposio Científico sobre Pueblos Indígenas de Costa Rica*, edited by Ramiro Barrantes, María Eugenia Bozzoli, and Patricia Gudiño, pp. 111-116. Editorial de la Universidad Nacional de Educación a Distancia. San José, Costa Rica.
1987 The Archaeological Evidence for Chiefdoms in Eastern and Central Costa Rica. In *Chiefdoms in the Americas*, edited by Robert D. Drennan and Carlos A. Uribe, pp. 105-116. University Press of America, Lanham.
1992 Wealth and Hierarchy in the Archaeology of Eastern and Central Costa Rica. In *Wealth and Hierarchy in the Intermediate Area*, edited by Frederick W. Lange, pp. 141-164. Dumbarton Oaks Research Library and Collection, Washington, D.C.
1998 Stone Sculpture and Pre-Columbian Cultural Evolution in the Central Highlands-Atlantic Watershed of Costa Rica. *Precolomb Art* 1: 19-41.

2003 From Jade to Gold in Costa Rica: How, Why, and When. In *Gold and Power in Ancient Costa Rica, Panama, and Colombia,* edited by Jeffrey Quilter and John Hoopes, pp. 159-204. Dumbarton Oaks Research Library and Collection, Washington, D.C.

Snarskis, Michael J., and Eugenia Ibarra
1985 Comentarios sobre el intercambio entre la Gran Nicoya, la Vertiente Atlántica y el Valle Central de Costa Rica en periodos precolombinos e históricos. *Vínculos* 11: 57-66.

Sol Castillo, Felipe
2005 Evaluación Arqueológica de los terrenos de Urbanización Los Sauces, Sitio Cafetal Rodríguez (A-286 CR), San Ramón, Alajuela. Unpublished document. Comisión Arqueológica Nacional. San José, Costa Rica.

Solís Alpízar, Olman E.
1991 Análisis de áreas de actividad en dos unidades habitacionales en el sitio Jesús María. Unpublished Licenciatura dissertation. Escuela de Antropología, Universidad de Costa Rica.
1992 Jesús María: un sitio con actividad doméstica en el Pacífico Central, Costa Rica. *Vínculos* 16: 31-56.

Solórzano Fonseca, Juan Carlos
2000 Descubrimiento y conquista de Costa Rica 1502-1575. In *Costa Rica: desde las sociedades autóctonas hasta 1914*, edited by Ana M. Botey Sobrado, pp. 67-111. Editorial de la Universidad de Costa Rica. San José, Costa Rica.

Spencer, Charles S.
1993 Human Agency, Biased Transmission, and the Cultural Evolution of Chiefly Authority. *Journal of Anthropological Archaeology* 12: 41-74.
1994 Factional ascendance, dimensions of leadership, and the development of centralized authority. In *Factional competition and political development in the New World*, edited by Elizabeth M. Brumfiel and John Fox, pp. 31-43. Cambridge University Press, Cambridge.

Stanish, Charles
2004 The Evolution of Chiefdoms: An Economic Anthropological Model. In Archaeological Perspectives on Political Economies, edited by Gary M. Feinman and Linda M. Nicholas, pp. 7-24. University of Utah Press, Salt Lake City.

Steward, Julian H.

1948 Preface. In Handbook of South American Indians, Vol. 4, The Circum-Caribbean Tribes, edited by Julian H. Steward. *Smithsonian Institution, Bureau of American Ethnology, Bulletin* 143: xv-xvii.

Stewart, John Q.
1941 An Inverse Distance Variation for Certain Social Influences. *Science* 93: 89-90.

Stoltman, James B., Joyce Marcus, Kent V Flannery, James H. Burton, and Robert G. Moyle
2005 Petrography Evidence shows that Pottery Exchange between the Olmec and their Neighbors was Two-Way. *Proceedings to the National Academy of Sciences of the United States of America* 102: 11213-11218.

Stone, Doris Z.
1958 *Introduction to the Archaeology of Costa Rica*. 1st ed. Museo Nacional de Costa Rica, San José.
1966 *Introduction to the Archaeology of Costa Rica*. 2nd ed. Museo Nacional de Costa Rica, San José.
1972 *Pre-Columbian Man Finds Central America: The Archaeological Bridge*. Peabody Museum Press, Cambridge, Massachusetts.
1977 *Pre-Columbian Man in Costa Rica*. Peabody Museum Press. Cambridge, Massachusetts.
1986 Pre-Columbian Trade in Costa Rica. In *Pre-Columbian Painted and Sculpted Ceramics from the Arthur M. Sackler Collection*, edited by Lois Katz, pp. 15-39. The Arthur M. Sackler Foundation and the AMS Foundation for the Arts, Sciences and Humanities, Washington, D.C.

Storey, Glenn R.
1997 Estimating the Population of Ancient Roman Cities. In *Integrating Archaeological Demography: Multidisciplinary Approaches to Prehistoric Population*, edited by Richard R. Paine, pp. 101-130. Center for Archaeological Investigations, Occasional Paper No. 24. Southern Illinois University at Carbondale, Illinois.

The Chifeng International Collaborative Archaeological Project
2003 *Regional Archaeology in Eastern Inner Mongolia: A Methodological Exploration*. Science Press, Beijing.

Troyo Vargas, Elena

1998 La arquitectura en la Costa Rica antigua. In *Historia de la arquitectura en Costa Rica*, edited by Elizabeth Fonseca and José E. Garnier, pp. 16-79. Fundación Museos del Banco Central de Costa Rica. San José, Costa Rica.

Turkon, Paula.
2004 Food and Status in the Prehispanic Malpaso Valley, Zacatecas, Mexico. *Journal of Antropological Archaeology*: 225-251.

Valerio Lobo, Wilson
1991 Patrones de asentamiento en Agua Caliente de Cartago. *Vínculos* 15: 25-44.

Valerio, Wilson, and Andrés Achío
2005 Rescate arqueológico del sitio Serafín (A-250 Sf, UCR-348) Urbanización Oropéndola, Candelaria, Naranjo, Costa Rica. Unpublished document. Departamento de Antropología e Historia. Museo Nacional de Costa Rica.

Vásquez Leiva, Ricardo
1991 Representaciones demográficas y estructurales de la organización social en las practices funerarias del sitio Agua Caliente, Cartago. *Vínculos* 15: 1-23.

Vásquez de Coronado, Juan
1976 [1563] Carta a Su Majestad el Rey D. Felipe II. In *Colección de documentos para la historia de Costa Rica*, Vol. I, edited by León Fernández Bonilla, pp. 104-112. Editorial Costa Rica. San José, Costa Rica.

Vradenburgh, Joseph A., Robert A. Benfer, Jr., and Lisa Sattenspiel
1997 Evaluating Archaeological Hypotheses of Population Growth and Decline on the Central Coast Peru. In *Integrating Archaeological Demography: Multidisciplinary Approaches to Prehistoric Population*, edited by Richard R. Paine, pp. 150-172. Center for Archaeological Investigations, Occasional Paper No. 24. Southern Illinois University at Carbondale, Illinois.

Wilkinson, Tony J.
2003 *Archaeological Landscapes of the Near East*. University of Arizona Press, Tucson.

Wilkinson, T. J., and D. J. Tucker
1995 *Settlement Development in the North Jazira, Iraq: A Study of the Archaeological Landscape*. Iraq Archaeological Reports 3. Aris & Phillips, London.

Willey, Gordon R.
1971 *An Introduction to American Archaeology.* Volume I, North and Middle America. Prentice-Hall, Englewood Cliffs.
1984 A Summary of the Archaeology of Lower Central America. In *The Archaeology of Lower Central America*, edited by Frederick W. Lange and Doris Z. Stone, pp. 341-378. University of New Mexico Press, Albuquerque.

Williams, Patrick Ryan, and Donna J. Nash
2002 Imperial Interaction in the Andes: Huari and Tiwanaku at Cerro Baúl. In *Andean Archaeology I*, edited by William H. Isbell and Helaine Silverman, pp. 243-266. Kluwer Academic/Plenum Publishers, New York.

Wright, Henry T.
1977 Toward an Explanation of the Origin of the State. In *Explanation of Prehistoric Change*, edited by James N. Hill, pp. 215-230. Albuquerque, University of New Mexico Press.
1981 The Southern Margins of Sumer: Archaeological Survey of the Area of Eridu and Ur. Appendix in *Heartland of Cities: Surveys of Ancient Settlement and Land Use on the Central Floodplain of the Euphrates* by Robert McC. Adams, pp. 295-346. University of Chicago Press, Chicago.
2007 *Early State Formation in Central Madagascar*: An Archaeological Survey of Western Avaradrano. Museum of Anthropology, University of Michigan Memoirs, Number 43. Ann Arbor, Michigan.

Zubrow, Ezra B. W.
1976 *Demographic Anthropology: Quantitative Approaches*. University of New Mexico Press, Albuquerque.

Zúñiga, Ricardo, and Mario A. Boza
1994 *The Humid Tropical Forest*. Fundación Neotrópica/Editorial Heliconia. San José, Costa Rica.